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STRAITS SETTLEMENTS

Vol. X 24th August, 1939 Part 2

CONTENTS

	Page
Araceae Malesicae II: Notes on some Indo-Malaysian Homalomena species, *by C. X. Furtado*	183
Notes on the Systematy and Distribution of Malayan Phanerogams III, *by E. J. H. Corner* (with plates 5-10)	239
Index of generic names	329
The Typification of Rhus javanica, *by C. X. Furtado*	330
Notes on Malayan Dipterocarpaceae V, *by C. F. Symington* (with plates 11-27)	336
Index of names	385

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Vol. X 24th August, 1939 Part 2

ARACEAE MALESICAE

II.—Notes on some Indo-Malaysian Homalomena Species

By C. X. FURTADO,

Botanic Gardens, Singapore

		Page
I.	Introduction and General Conclusions ..	183
II.	Sections of the Genus	184
III.	Key to the Sections	186
IV.	Systematic Notes on Species:	
	A. Section CHAMAECLADON	186
	B. Section EU-HOMALOMENA	213
	C. Section CYRTOCLADON	221
V.	Summary of the Systematic Notes	229
VI.	Index to the Numbers Cited	230
VII.	Index to the Botanical Names	234

I. Introduction and General Conclusions

HOMALOMENA plants in general, but more especially those native of Malaya (Malay Peninsula) and the Sunda Islands (Sumatra, Java, Borneo and small islands within the area), vary a great deal in all their vegetative characters, and to a certain extent in their reproductive characters also, the variations depending not only on the age of the plant but also on such environmental conditions as soil, exposure, flooding and humidity. The greatest variability is noticed in species which grow on stream sides and on rocks near waterfalls and in streams, where they are subject to a graded intensity and frequency of flood, spray and to a certain extent, of insolation.

This ecologic diversity within the plants of the same species or variety makes an analysis of the genus into its constituent species and varieties an extremely difficult problem. A key that would cover all these variations would become too bulky to be of any practical use. The task of analysing the genus into its species would be much simplified if specimens of as many *Homalomena* species as possible

were collected again to show the range of variation, and if their spathes with flowers and fruits were preserved in spirit.

While naming and arranging Malayan species of this genus, I noticed that some systematists have not taken due cognizance of their range of variability, so that, in some cases, either one and the same name has been used for different species because their specimens agree in colour (*e.g. H. purpurascens*) or many names have been bestowed on the same species because the specimens studied showed marked differences among themselves concerning colour, size and shape of leaves (*e.g. H. obliqua, H. Griffithii, H. Kingii,* etc.). Evidence is not lacking to show that some species are purely "geographical", that is, one and the same species is made to pass under different names according to the country of origin of the specimens to be named, (*H. paludosa* and *H. propinqua; H. coerulescens, H. rubra,* etc.).

In order to clear the nomenclatural tangles of the Malayan species, therefore, I was obliged to study many non-Malayan species, but not so many as to consider this study of mine as a monographic revision of the Indo-Malaysian *Homalomena.*

I am much indebted to the Directors of the Herbaria at Kew, Leiden, and Buitenzorg for their co-operation either by sending on loan some of the authentic specimens in their herbaria, or by supplying either information concerning the types or copies of such original descriptions as were not available in Singapore.

In citing the exsiccatæ, I have omitted all reference to the herbarium when the specimens cited are conserved in the Singapore herbarium, but have inserted appropriate abbreviations to indicate the other herbaria, the initials "HB" having been adopted for the Buitenzorg Herbarium (Herbarium Bogoriense).

For the nomenclature adopted in this paper for types, see *Gard. Bull. Straits Settlements* IX *part* 3, 1937 *pp.* 285–309.

II. Sections of the Genus

So far only six species of *Homalomena* are known from America, all belonging to the section CURMERIA (LIND. et ANDRE) ENGL., the remaining being confined to Indomalaysia. The latter are at present divided into two sections: CHAMÆCLADON and EU-HOMALOMENA; but in order to bring out the affinities existing between the different groups of species, it seems desirable to divide them into three sections, namely, CHAMÆCLADON, EU-HOMALOMENA *sensu stricto,* and CRYTOCLADON, as defined below. The new section is the most distinct of the three, having the spathes

always contracted above the female inflorescence, often without staminodes among the female flowers, and a space or zone (either vacant or sparsely or thickly covered with neutral flowers) frequently intervening between the male and the female inflorescence.

A. Sectio **Chamæcladon** (MIQ.) ENGL. in Pflanzenreich IV. 23 D. a [55] (1912) p. 31.

Chamaecladon MIQ. in Bot. Zeit. (1856) 564 et Fl. Ind. Bat. III (1856?) 212; SCHOTT, Gen. Ar. (1858) t. 60 et Prodr. (1860) 312; ENGL. in DC., Mon. Phan. II (1879) 343, et in ENGL. et Prantl, Nat. Pflanzenf. II, 3 (1887) 130; sub titulo generis.

Spathae ellipsoideæ in medio non constrictæ, 0.5–3 cm. longæ, rarissime longiores. *Staminodia* pistillis duplo breviora. *Caudiculus* erectiusculus vel reptans, epigeus. *Folia* rarissime sagittata vel profundo cordata, plerumque minus quam 15 cm. lata.

HABITAT: Malesia usque Novam Guineam. In India Birmaniaque non legitur. Formæ numerosissimæ in Malaya, Sumatra et alteris insulis Sundaicis reperiuntur; ad orientem versus species hujus sectionis perpaucæ.

B. Sectio **Eu-Homalomena** ENGL. in DC, Mon. Phan. II (1879) 333 et in Pflanzenreich *tom. cit* p. 51. p. parte.

Homalomena SCHOTT pro parte typica.

Spathae oblongæ, supra inflorescentiam femineam haud contractæ. *Staminodia* pistillum æquantia, raro deficientia (?). *Caudex* epigeus. *Folia* profundo cordata, sæpe saggitata vel fere, plerumque quam 15 cm. mults latiora.

HABITAT: In India, Malesia usque Novam Guineam. Formæ numerosissimæ in Malaya, Sumatra et alteris insulis Sundaicis leguntur.

C. Sectio **Cyrtocladon** FURTADO **sect. nov.**

? *Cyrtocladon* GRIFF., Notul. III (1851) 147 sub titulo generis.

Spathae supra inflorescentiam femineam contractæ, rostratæ. *Staminodia* pistillis æquilonga, interdum deficientia. *Spadix* inter inflorescentiam femineam et masculam zona floribus neutris perpaucis vel numerosis obsessis interdum posita. *Caudex* epigeus. *Folia* lanceolata, vel ovato lanceolata, basi cuneata, vel profundo cordata, sagittata vel non.

This section may be identical with the genus *Cyrtocladon* GRIFF. whose spathes, however, are described as shedding the apical portions in the manner of the species of *Piptospatha* and *Schismatoglottis*. I have not seen the type; but from the general description the specimen described under *Cyrtocladon* appears to be identical with *Homalomena rostrata* GRIFF., a species also simultaneously described.

HABITAT: In Insulis Sundaicis usque ad Peninsulam Malaianam sed formæ numerosissimæ in Borneo reperiuntur. In alteris regionibus Indomalesianis aut ad orientem aut ad septemtrionem vergentibus species hujus sectionis non repertæ sunt.

III. Key to the Sections

1.a. Spatha 4 cm. vel magis longa, plus quam 1.5 cm. crassa, in medio constricta vel non. Staminodia pistillis æquilonga vel nulla.....(2).

1.b. Spatha ad 4 cm. usque longa, plerumque minor, rarissime longior, ad 1.5 cm. crassa, haud medio constricta. Staminodia pistillis breviora.....*Chamaecladon* (MIQ.) ENGL.

2.a. Spatha oblonga, haud in medio contracta. *Eu-Homalomena* ENGL. *emend* FURTADO.

2.b. Spatha supra inflorescentiam femineam contracta, rostrata. *Cyrtocladon* FURTADO *sect. nov.*

IV. Systematic Notes on Species

A. SECTION: CHAMÆCLADON

1. **Homalomena argentea** RIDL. in Journ. Bot. XL (1902) 35, Mat. Fl. Mal. Pen. III (1907) 27; ENGL. in Pflanzenreich IV. 23 Da [55] (1912) 31; RIDL., Fl. Mal. Pen. V (1925) 107.

Chamaecladon Griffithii var. *argenteum* RIDL. in Trans. Linn. Soc., London, III (1893) 394 pro parte. *Syn. nov.*

H. Griffithii (SCHOTT) HOOK. f. *sensu* RIDL., Fl. *cit.* (1925) 106 p. p.

The species was described from living specimens grown in the Botanic Gardens, Singapore, where they were sent by DERRY from Malacca. There is no specimen in the Singapore herbarium (the plant in the Gardens being no longer extant) which agrees in all respects with the description given by RIDLEY; nor is there any specimen which has been definitely labelled by RIDLEY as *H. argentea.*

Subsequent to the publication of the species, ENGLER visited Singapore and in his monograph (*l.c.*) stated that he had seen the plant cultivated in the Singapore Gardens. But the plants then growing in Singapore must have been poor and too few to enable ENGLER to make herbarium specimens of the species, or to add substantially to the brief description given by RIDLEY. It is true that ENGLER placed the species in the *Clavis Specierum* among those species that produce a few primary nerves to the leaves; but in the text of the description itself, RIDLEY'S indefinite phrase "nervis pluribus" has been paraphrased by ENGLER as "nervis lateralibus pluribus, angulo acuto adscedentibus".

ENGLER'S description may, therefore, be said to be substantially the same as that given by RIDLEY, there being only a slight disagreement in the dimensions of the leaves.

There is, however, in the Singapore herbarium a specimen which is recorded to have been collected at Bukit Sadanen in Malacca by DERRY in September 1890. The sheet on which it is mounted is numbered "10" by RIDLEY himself and the field notes, also in RIDLEY'S hand, run thus:

> "Almost stemless. Sheath of leaves very broadly spread. Petiole grooved, strongly ribbed. Leaf silvery above."

The specimen was first named as *Chamaecladon Griffithii* var. *argentea*, but later the specific epithet was cancelled by RIDLEY so that the name reads thus: "*Chamaecladon* var. *argentea*".

Now since in the original description RIDLEY stated that *H. argentea* was a species closely allied to *Homalomena* (sect. *Chamaecladon*) *Griffithii*, and that "it was first collected alive by Mr. DERRY" in Malacca, and since number "10" corresponds to the number of *H. argentea* in RIDLEY'S *Materials* (III, 1907)—RIDLEY having frequently used such notations to indicate the species described in the *Materials*—it seems reasonable to conclude that this specimen of DERRY'S represents a plant from the type-collection that supplied the material that was grown in Singapore and later described by RIDLEY.

The specimen itself consists of one leaf and of some spadices enclosed in their spathes. Two of the spathes are cut open and expose in each a sessile spadix having its male inflorescence about three times as long as the female, characters that agree entirely with those given by RIDLEY. But though the peduncles are 12–15 mm. long and the spathes 14–16 mm., the spathes are cuspidate, while both RIDLEY and ENGER describe them as being non-cuspidate. Further the following discrepancies in the descriptions and the specimen are noticed:

		RIDLEY'S description	ENGLER'S description	DERRY'S specimen
Lamina	length:	3 poll.	1.1–1.3 dm.	1.3 dm. (= 5 ins.)
	width:	1¼ poll.	3–4 cm.	4.5 cm. (nearly 2 ins.)
Petioie	length:	2 poll.	3–5 cm.	7 cm. (nearly 3 ins.) (without the sheathed portion 4 cm.=1½ ins.)

Since ENGLER, who had in 1905 examined the type plants in the Singapore Botanic Gardens, gave a little greater dimensions of the leaves than the ones given by RIDLEY, one is justified in concluding that, when RIDLEY drew his specific description, the plant was still not fully developed, or was making poor growth, a surmise which would also explain why the spathes are described as not being cuspidate and why ENGLER himself was not able to gather even a sterile specimen of the plant for the Berlin Herbarium.

In the absence of any specimen from the type plant, I go by DERRY'S specimen, which as pointed out above, came probably from the same collection as supplied the type plant to the Botanic Gardens, Singapore. It could be called Neotype or Neotopotype. Since RIDLEY did not cite the locality "Bukit Sadanen" and did not give higher dimensions that would include this neotype, it appears that RIDLEY had not examined this specimen at the time of preparing the description.

This specimen of DERRY'S agrees very well with HOLTTUM 9736 from Negri Sembilan cited by RIDLEY (1925) as *H. Griffithii*. Unfortunately all the duplicates of the latter collection have been distributed, so that one is now not able to study the different variations represented. But FURTADO 33127, also from Negri Sembilan, represents the same species. Some specimens in the last mentioned collection have a petiole up to 10 cm. long and a lamina up to 16 cm. long and 6.5 cm. wide. The peduncles are very short, so that they are hardly visible, the inflorescences remaining in consequence inconspicuous among the petioles and sheaths.

MALAYA: *Malacca:* Bukit Sadanen (DERRY, Sept. 1890: *Neotype*). *Negri Sembilan:* Selaru (HOLTTUM, 9736); Bukit Tumian (ALVINS, 1849) Gunong Angsi (RIDLEY, II–1904; FURTADO, 33127 and 33127b).

2. **Homalomena argentea** var. **purpurascens** FURTADO **var. nov.**

A forma typica differt lamina foliorum minus coriacea, subtus rubra, supra rubicundo-viridis.

This may be identical with *H. obscurifolia* v. ALD. v. ROS.

MALAYA: *Negri Sembilan:* Gunong Angsi, alt. circa. 700 ft. FURTADO, 33129). Among rocks in a small stream called Sungei Bendol. Rare.

3. **Homalomena batœensis** ENGL. in Pflanzenreich iv. 23. Da [55] (1912) 47 fig. 26 K.

H. multivenosa RIDL. in Kew Bull. (1926) 92. *Syn. nov.*

H. pygmaea sensu ENGL. op. cit. p. 34 p. p.

I have compared the haptoholotypes of *H. multivenosa* with the holotype of *H. batoeensis* and find no significant difference to warrant their separation into two species. *H. batoeensis* is very closely allied to *H. lancifolia* of the Malayan Peninsula and may prove to be a variety of this. *H. oblanceolata,* which also appears to be very near to *H. batoeensis,* is distinguished (judging from a few specimens examined) by being prostrate, and repent, and not erect as the other species.

SUMATRA: *Batu Island* (RAAP: 186, Holotype, HB; 266, HB). *Sibolangit* (LÖRZING, 5361 & 5728, HB); *Brani* (BÜNNEMEIJER, 3104, HB). *Mentawi Islands* (BODEN-KLOSS, 11441, Haptoholotype of *H. multivenosa;* IBOET, 30, HB.).

4. **Homalomena Carrii** FURTADO **spec. nov.**

H. tenuispadice affinis, sed minor, lamina foliorum oblongo-elliptica, basi obtusa vel subtruncata (haud sagittata).

Caudex erectus, 1.5 cm. usque crassus. *Petiolus* circa 15 cm. longus ad tertiam partem usque vaginatus. *Lamina* foliorum oblongo-elliptica, maxima latitudine in medio sita, inæquilateralis, utrinque attenuata, apice acuminata, basi obtusa vel subtruncata, 15–20 cm. longa, 6.5–7.5 cm. lata, nervis lateralibus primariis utrinsecus 7–9, prominentibus, secundariis quam eis vix gracilioribus, tertiariis gracillimis. *Pedunculus* ad 7 cm. longus, gracilis. *Spatha* 2.5–3 cm. longa, sæpe in cuspidem ad 1 cm. usque longam exeuns. *Spadix* spatham æquans; pars feminea masculæ æquilonga, vel etiam paullo brevior quam ea.

PAPUA: Koitaki, alt. 1500 ped. (CARR, 12053). Plants about 15 inches tall. Spathes green.

5. **Homalomena confusa** FURTADO **spec. nov.**

Chamaecladon angustifolium (JACK) SCHOTT in Bonpl. VI (1858) 369, Prodr. (1860) 313; ENGL. in DC., Mon. Phan. II (1879) 344, in Arac. Exsicc. et Illustr. no. 103: omnino excl. basinymo.

H. angustifolia (JACK) HOOK. f., Fl. Brit. Ind. VI (1893) 533; RIDL., Mat. Fl. Mal. Pen. II. (1907) 28; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 31 fig. 12; RIDL., Fl. Mal. Pen. V (1925) 108: omnino pro parte haud typica.

H. angustifolia var. *parvula* RIDL., Fl. Malay Pen. V (1925) 109. *Syn. nov.*

H. trapezifolia sensu RIDL. in Journ. Roy. Asiat. Soc. Str. Br. LVII (1910) 112 p. p.

Ab *H. Stollei* ENGL. et KRAUSE, cui affinissima, differt foliorum lamina magis coriacea, sæpe etiam latiore, apice longe acuminata, raro falcata, petiolo fragiliore, spatha magis coriacea.

Herba parva ad 25–30 cm. longa caudice prostrato, saxicolo. *Petiolus* lamina longior vel paulo brevior, vel laminæ æquilongus, ad 20 cm. longus, longe vaginatus. *Lamina* foliorum elongato vel lineari lanceolata, sæpe trapezoidea, utrinque sæpe plus basin quam apicem versus oblique attenuata; 7–15 cm. longa, 12–30 mm. lata, latitudine sua 4–6-plo longior; nervis lateralibus primariis utrinsecus 2–4, adscendentibus; secundariis valde gracilioribus, fere inconspicuis, subparallelis. *Pedunculus* 2.5–5 cm. longus. *Spatha* oblonga, haud in medio constricta, apice subito acuminata, 1.5–2 cm. longa, coriacea, costulata. *Spadices:* inflorescentia mascula 2½–3-plo longior quam feminea.

According to Mr. CORNER this plant with its long creeping rhizomes forms a dense mat on rocks, often covering them completely.

The field notes on CORNER 33692 (Pahang) state that the petioles, peduncles and spathes in some plants are pinkish and that the species is found growing on rocks in streams at the altitudes of 3,000–6,500 ft.

The species was confused with *Calla angustifolia* JACK =*Homalomena humilis* var. *pumila* (see my remarks on that variety).

In the general aspect of the plants, *H. confusa* may be easily confused with *H. Stollei,* but it differs in the texture and shape of the leaves and in the shape of the spathes, and resembles some forms of *H. humilis* and *H. paucinervia.*

MALAYA: *Kedah,* Gunong Jerai (RIDLEY, 5123, *Holotype*). *Kemaman:* Sungei Nipah (CORNER, 24–vi–1932). *Pahang:* Teku River on Gunong Tahan (RIDLEY, 15491: type of *H. angustifolia* var. *parvula*); Gunong Tahan alt. 5800–7000 ft. (HANIFF and NUR, 7969 RIDLEY, 16188; CORNER, 33692); Tahan River (RIDLEY, 2391). *Penang:* loc. incert. (WALLICH no. 8959 partim, vidi tantum Iconem SCHOTTII ab ENGLERIO reproductam); Government Hill (RIDLEY, in 1899); Telok Bahang (BURKILL, 4552; CURTIS, 2886). *Perak:* Tea Gardens (RIDLEY, in 1891); Bujong Malacca (RIDLEY, 9793); Ulu Temango (RIDLEY, 14305). *Selangor:* Pahang track (RIDLEY, 8488).

6. Homalomena consobrina (SCHOTT) ENGL. in Pflanzenreich IV. 23. *Da* [55] (1912) 46.

Chamaecladon consobrinum SCHOTT in MIQ., Ann. Mus. Lugd. Bat. I (1863) 126; ENGL. in DC., Mon. Phan. II (1879) 344 et Illustr. Arac. n. 98.

The type of this species has very thin, papyraceous leaves and spathes. Otherwise it could be easily mistaken for some forms of *H. batoeensis* and *H. paucinervia* to which it has great affinities.

SUMATRA: *Loc. incert.* (KORTHALS in Herb. Leiden, Holotype).

RIAU ARCHIPELAGO: Pulau Tujoh on Gunong Ranai (BÜNNEMEIJER, 5811, HB).

ANAMBAS ARCHIPELAGO: Bunguran Island on Gunong Ranai (VAN STEENIS, 1191, HB).

7. **Homalomena Corneri** FURTADO **spec. nov.**

Inter species sectionis *Chamaecladonis* magnas spadicibus longissimis (*e.g. H. bellula, H. deltoidea* et *H. tenuispadix*) hæc species collocanda, sed foliorum lamina haud deltoidea vel sagittata aut basi cordato-lobata, nervis lateralibus primariis pluribus facile distingui potest. Spathæ spadicisque habitu magis speciebus sectionis *Eu-Homalomenae* similis, attamen propter staminodia parvissima sectioni *Chaemaecladoni* attribuenda.

Herba reptans, suffruticosa, majuscula, caudiculo sicco 7–12 mm. in diametro. *Petiolus* ad 35 cm. usque longus, supra vaginam 3–4 mm. amplus, basi ad 7 cm. usque vaginatus. *Lamina* foliorum elliptico-ovata, maxima latitudine infra medium sita, apicem versus sensim attenuata, summo in acumen 2–2.5 cm. longo contracta, basi subtruncata, obtusa, interdum oblique rotundata, cum acumine 25–30 cm. longa, 9.5–12.5 cm. lata, nervis primariis lateralibus utrinsecus 7–8 (primariis subprimariisque cunctis 10–12), secundariis tertiariisque pluribus, subparallelis. *Pedunculi* pauci, 6-9 cm. longi. *Spatha* oblonga, medio non constricta, coriacea, apice breviter cuspidato-acuminata, 4–4.5 cm. longa, 1.5 cm. ampla. *Spadix* cylindricus, circa. 3.8 cm. longus, basi stipite 2–4 mm. longo suffultus, parte basali feminea laxiflora fere duplo breviore quam mascula apicali. *Staminodia* brevissima, ad pistillorum basin sita. *Pistilla* ovoidea, summo in stigma orbiculare contracta.

MALAYA: *Johore*, Sungei Pelapa Kiri, on rocks and banks above the flood level, not in the stream bed (CORNER, 33581).

8. **Homalomena Curtisii** RIDL. in Journ. Bot. XL (1902) 34; RIDL., Mat. Fl. Mal. Pen. III (1907) 28; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 34; RIDL., Fl. Malay Pen. V (1925) 108.

From the description it is evident that the plant was described from a living specimen; but the only specimen preserved by RIDLEY to represent the holotype consists of a leaf and a few spathes of a plant that was being cultivated in the Botanic Gardens, Singapore, in January 1899. The plant was introduced from the Botanic Gardens, Penang, where CURTIS had brought it from Perak, the locality "Bujong Malacca" being preceded with a query mark to show that the exact locality of its collection in the wild state was uncertain. This query mark has been omitted in the published descriptions.

From the meagre material available it is very difficult to identify the species. Hence in interpreting it, another specimen made by CURTIS on 21st October 1897 from a plant growing in the Penang Gardens may be used. This

specimen was taken from a batch of plants obtained from Perak (exact locality is not given) and is moreover named *H. Curtisii* in RIDLEY'S hand. This specimen appears to be con-specific with the holotype of the species, but unfortunately it is sterile.

The plant may be identical with *H. humilis* var. *ophirensis*, which has also short spathes, long petioles and often narrow, oblique acuminate leaves.

MALAYA :*Perak:* Bujong Malacca? (cult. in Hort. Bot. Singap. leg. RIDLEY in January 1899, Holotype; cult. in Hort. Bot. Penang, leg. CURTIS, 21–X–1897, Haptoholotype).

9. **Homalomena deltoidea** HOOK. f., Fl. Brit. Ind. VI (1893) 536; RIDL., Mat. Fl. Mal. Pen. III (1907) 25; ENGL. in Pflanzenreich IV. 23. Da [55] (1912) 45; RIDL., Fl. Mal. Pen. V. (1925) 105.

This species bears perhaps the largest spathes in the section *Chamaecladon*. Both in the dimensions of the spathes and in the shape of the leaves, the species can easily pass as a member of the section *Eu-Homalomena*. The spathes end in a long wiry cusp and are much longer than the spadix within, two characters that make the species a close relative of *H. Hendersonii*.

MALAYA: *Kemaman*, Ulu Kajang (CORNER, 30436). *Kelantan*, Sungei Keteh (NUR with FOXWORTHY, 7–II–1924). *Perak*, Taiping Hills (RIDLEY, Dec. 1902; HENDERSON, 10185). *Negri Sembilan*, Gunong Angsi (NUR, 11595). *Johore*, Gunong Pulai (RIDLEY, Jan. 1904; MAT, in 1892); Gunong Panti (CORNER, Jan. 1930).

10. **Homalomena elliptica** HOOK. f., Fl. Brit. Ind. VI (1893) 536; RIDL., Mat. Fl. Mal. Pen. III (1907) 28; ENGL. in Pflanzenreich IV. 23. Da [55] (1912) 37 fig. 17; RIDL., Fl. Mal. Pen. V (1925) 108.

H. Griffithii var. *falcata* RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIX (1905) 50. *Syn nov.*

H. trapezifolia HOOK. f. l. cit.; RIDL., Mat. cit. (1907) 28; ENGL. in op. cit. p. 49; RIDL. Flor. cit. (1925) 107 partim. *Syn. nov.*

There are various grades of transitions between the *H. elliptica* and the *H. trapezifolia* forms rendering difficult their segregation into well defined varieties. In the typical *elliptica* form the leaf blade is broadest in the middle, while in the *trapezifolia* form the leaf blade is broadest at the base which in consequence becomes rounded.

ENGLER depicts *H. elliptica* as a species with ovules fixed at the base of placenta; but in a spadix from the collection FURTADO 33082, they were fixed all along the middle partition of the ovary.

From the constant deviations in the disposition of the ovules on the placenta, it appears to me that, in certain groups of species, this character is very variable and hence inadmissible as a basis of specific discrimination.

This species could be well reduced as a variety of *H. Griffithii.* If I have retained its specific rank, it is because the transitions between this and *H. Griffithii* have not yet been noticed.

Perhaps *H. hayupensis* ENGL. and *H. habokoana* V. ALD. V. ROS. are varieties of this species.

MALAYA: *Perak:* loc. incert. (SCORTECHINI: 256 & 256a, Haptoholotypes of *H. elliptica;* 606a, Haptosyntype of *H. trapezifolia*); Temango (RIDLEY, 14306); Kulim hot springs in Grik (HENDERSON, 23872); Waterfall (WRAY, 1976); Sungei Tampah at the foot of Gunong Chantek in Gopeng (FURTADO, 33082); Sungei Gepai in Bidor (CORNER, 31687); Sungei Bil (CORNER, 33687) Batu Tegoh at Taiping (HENDERSON, 10318, HB). *Malacca,* Sabatu (BURKILL, 2820).

BORNEO: *Sarawak,* Kuching (RIDLEY, 12417).

11. Homalomena elliptica HOOK. f. **var paucinervia** FURTADO **var. nov.**

H. multinervia RIDL. in Journ. Bot. XL (1902) 36 et Mat. Fl. Mal. Pen. III (1907) 29; ENGL. op. cit. (1912) 49; RIDL., Fl. Malay Pen. V (1925) 109. *Syn. nov.*

Differt a forma typica foliorum lamina angustiore, apicem versus magis attenuata, nervis primariis paucioribus.

Herba 20–30 cm. alta. *Petiolus* usque 15 cm. longus. *Lamina* 8–12 cm. longa, 3–5.5 cm. lata, maxima latitudine infra medium vel ad basin sita, basi cuneata vel truncata, apicem versus attenuata, falcata, longissime acuminata, summo cuspidata, nervis parimariis 4–5, interdum vix validioribis quam secundariis gracilibus.

The Perak collection is represented by two plants mounted on the same sheet, both of which show many gradations of leaf variations which link *H. multinervia* with *H. elliptica.* In one plant some leaves approach very near those of the form described as *H. multinervia;* while others look like those described as *H. Pierreana* ENGL. or *H. sulcata* ENGL. or midway between these two. Otherwise the plant is hardly distinct from *H. elliptica.*

MALAYA: *Perak,* Gunong Hijau (RIDLEY, in 1892, Holotype). *Malacca,* Mount Ophir (RIDLEY, 6–VI–1892, Holotype of *H. multinervia*).

12. Homalomena ellipticifolia FURTADO **spec. nov.**

H. pygmaea (HASSK.) ENGL. forma *longipes* V. ALD. V. ROS in Bull. Jard. Bot. Buitenz. IV (1922) 333.

Ab *H. humili*, cui affinis, differt: petiolis gracilibus multo longioribus; foliorum lamina magis coriacea, elliptica, utrinque æqualiter attenuata. Facie *H. ellipticae* simillima sed recedit: petiolo angustiore, pedunculis spathisque brevioribus.

Herba erecta. *Petiolus* gracilis, ad 17 cm. longus, subduplo usque triplo longior quam lamina, vagina "rubescente" breviter instructus. *Lamina* foliorum 5–10 cm. longa, 2.5–5 cm. lata, 2–3–plo longior quam latitudine, elliptica, coriacea, utrinque attenuata, supra viridis, subtus pallidior, nervis primariis subparimariisque utrinsecus 6–10, fere parallelis, subtus valde prominentibus, alteris inconspicuis. *Pedunculi* breves, solitarii vel perpauci, gracillimi, ad 1.5 cm. longi. *Spatha* "rubescens", circa 1 cm. longa, papyracea. *Spadix* spathæ fere æquilongus, sessilis(?), in tertia parte basilari femineus, floribus femineis masculisque putrefactis.

SUMATRA: *Simalur Island*, Tapah (ACHMAD, 1723, Holotype in HB. and Meroholotype in Herb. Singap. The duplicates are said to have been distributed to Kew, Leiden and Manila).

13. **Homalomena Griffithii** (SCHOTT) HOOK. f., Fl. Brit. Ind. VI (1893) 534; RIDL., Mat. Fl. Mal. Pen. III (1907) 26; ENGL. in Pflanzenreich IV 23. Da [55] (1912) 43 fig. 23; RIDL., Fl. Malay Pen. V (1925) 106.

Chamaecladon Griffithii SCHOTT in Bonpl. VI (1858) 369, Prodr. (1860) 315; ENGL. in DC., Mon. Phan. II (1879) 346 et Arac. Exsicc. et Illustr. n. 113. *Basinym.*

C. metallicum N. E. BR. in Illustr. Hort. XXXI (1884) 173 t. 539. *Syn. nov.*

C. obliquatum SCHOTT in Bonpl. VI (1858) 369, Prodr. (1860) 315; ENGL., Mon. cit. (1879) 347. *Syn. nov.*

C. ovatum SCHOTT in Bonpl. VII (1859) 301, Prodr. (1860) 315; ENGL., Mon. cit. (1879) 348. *Syn. nov.*

H. falcata RIDL. in Journ. Bot. XL. (1902) 35 et Mat. Fl. Mal. Pen. III (1907) 27; ENGL. Pflanzenr. cit. (1912) 34. *Syn. nov.*

H. Griffithii var. *ovata* (SCHOTT) ENGL. in Pflanz. tom. cit. (1912) 44; RIDL., Fl. Mal. Pen. V. (1925) 106. *Syn nov.*

H. Kingii HOOK. f., op. cit. (1893) 535; ENGL. in. op. cit. (1912) 41 fig. 21.

H. metallica (N. E. BR.) ENGL. in op. cit. (1912) 51. *Syn. nov.*

H. obliquata (SCHOTT) HOOK. f. op. cit. (1893) 534; ENGL. op. cit. p. 39 pro parte; RIDL., Fl. Mal. Pen. V (1925) 107. *Syn. nov.*

H. ovata (SCHOTT) HOOK. f. op. cit. (1893) 536 (non *H. ovata* ENGL.). *Syn. nov.*

With the exception of the type of *H. falcata,* I have not seen the type of any of these species. ENGLER'S Illustr. No. 113, which I have seen, purports to be of the holotype of *H. Griffithii;* if so GRIFFITH 5963 labelled at Kew as the type of *H. Griffithii* is not the holotype, though it may belong to the holotype collection. My interpretation of these species is therefore based entirely on the descriptions, illustrations and citations given by HOOKER, ENGLER, and RIDLEY.

The species is very variable in size, shape and texture. The spadices are usually distinctly stipitate, but sometimes shortly stipitate spadices are also found, perhaps a reason why HOOKER described *H. Kingii* and *H. obliquata* as species with sessile spadices. In his *Clavis Specierum,* ENGLER (Pflanzenr. cit. 1912 p. 27) has put both *H. Kingii* and *H. obliquata* among species having sessile spadices, but the figures and descriptions given by him in the text are not in harmony with this statement in the *Clavis.* (*H. elliptica* is also placed in the *Clavis* among species having sessile spadices, though HOOKER, its author, stated it to be distinctly stipitate and ENGLER'S figure of it also shows a stipitate spadix). All this shows that this character is very unstable and is not a good guide for distinguishing between various forms in this and allied species.

In the cases examined I found the ovules were fixed on the placenta above its base.

In the type of *H. falcata* the leaves are like those of *H. Pierreana* figured by ENGLER (op. cit. 1912); but transitions between that form and the *H. obliquata* form also occur, even in the same collection. Judging from the great range of variability manifested by plants in each collection, it appears that one and the same plant passes into different forms under different conditions of age and environment. Hence without being able to distinguish between the forms that are stable and those that are not, I am loth to arrange the various forms into varieties. But for the guidance of field workers, I have arranged the different variations into formæ: *viz.*:—

(a) forma **eu-Griffithii** (= *H. ovata* and *H. Griffithii*).

Planta plus quam 12 poll. alta. *Petiolus* quam lamina plerumque longior. *Lamina* oblonga, ovata, vel ovoideo-falcatoidea, basi obtriangularis, vel rotundata vel cordulata, apicem versus sensim vel vix attenuata, usque 20 cm. longa, 5–10 cm. lata.

Forms growing in swamps and in places at some distance from streams often produce papyraceous leaves which dry brown. Similar leaves are also found in other forms.

MALAYA: *Kemaman,* Sungei Nipah (CORNER, on 24–vi–32). *Kelantan,* Kuala Pertang (HANIFF & NUR, 10362); Sungei Galas at Gua Musang (HENDERSON, 22600). *Pahang,* Sungei Sat at Ulu Tembeling (HENDERSON, 22000); Sungei Chelia at Chegar Perak (HENDERSON, 19372). *Malacca,* Pangkalan Miniak (ALVINS, vern. nom. Kumayan Jantan); Merlimau (ALVINS, vern. nom. Kumayang); Bukit Kayu Arang (ALVINS, vern. nom. Kulumayang Padi); Ayer Panas (GRIFFITH, 5963, Herb. Kew); Jasin (GOODENOUGH, 1661). *Selangor,* Ginting Simpah (HUME, 9457). *Johore,* Kluang (HOLTTUM, 9420); Tebrau River (RIDLEY, 13239) *Singapore,* Bukit Timah (BURKILL, 4080).

(b) forma **Kingii** FURTADO (= *H. Kingii* HOOK. f.).

Probably this represents a form growing in swamps or in places at some distance from streams. The leaves in this dry brown, and are less coriaceous. Leaves having this colour and texture also occur in formæ *obliquata* and *eu-Griffithii.* The plant is usually about 30 cm. long and petioles are shorter than, or equal to, lamina.

MALAYA: *Province Wellesley,* Bukit Mertajam (BURKILL & HOLTTUM, 9016) *Malacca,* Loc. incert. (ALVINS). *Johore,* Sungei Kayu (KIAH, 32056); Batu Pahat (RIDLEY in Nov. 1900). *Singapore,* Bukit Timah (RIDLEY in 1898); Chua Chu Kang (GOODENOUGH: 10–II–1890; 21–XII–1889; Forest Guard under RIDLEY, in May 1889); Tanjong Gol (RIDLEY, in 1892).

(c) forma **sigmoidea** FURTADO **f. nov.**

H. Scortechinii HOOK. f. sensu RIDL., Fl. Malay Pen. V (1925) 109 quoad specimen selangorense.

Herba repens, saxicola. *Lamina* sigmoideo-falcata, circa 12 cm. longa, 4–6 cm. lata. Differt a formis prioribus et sequentibus lamina sigmoideo-falcata, magis coriacea.

Apparently this form is restricted to such substrata as rocks or sand which are constantly wetted by sprays, and only occasionally are subject to floods.

MALAYA: *Pahang,* Sungei Tras near Raub (BURKILL & HANIFF, 16937, Holotype). *Selangor,* Ulu Gombak (BURKILL, 9965). *Negri Sembilan,* Bukit Tumiang (ALVINS, 2239, vern. nom. Assam Tikus).

(d) forma **obliquata** FURTADO **f. nov.** (= *H. obliquata;* and *H. Griffithii* var. *obliquata* RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIV, 1905 p. 177).

Foliorum *petiolus* plerumque brevior quam lamina: *Lamina* oblongo-lanceolata, basi paulum obliqua vel non, acuta vel subrotundata, apicem versus falcatoidea, acuminata, usque 15 cm. longa, 3–5.5 cm. lata. *Spadix* stipitatus, ovula placentis centralibus tota longitudine affixa.

In all cases examined by me the spadix was stipitate and the ovules were fixed above the base of the placenta.

ENGLER (l.c.) states that the spadix is sessile, but the figure (18, p. 38) depicts a stipitate spadix with ovules fixed at the base of the placenta.

There is a great deal of variation in this form both regarding the size, colouration and shape, some plants from the same collection approaching very near the *eu-Griffithii* form. CORNER 33578 and 33578a-e, are all from the same collection, but I gave them different letters in order to indicate the differences in colouration noted by me in the living state, *viz.*:—

33578: Petioles, peduncles and young leaves reddish. Spathes and older leaves green.

33578*a*: Petioles reddish. Peduncles, spathes and leaf-blade green.

33578*b*: Petioles, peduncles, leaf-blades and spathes green. No young terminal leaf.

33578*c*: Like 33578*b*, but the terminal leaf is young and reddish.

33578*d*: Like 33578*b*, but the spathes are reddish.

33578*e*: Peduncles, petioles and occasionally spathes darkish.

Forms very similar to these also occur in *Eu-Griffithii*, which suggests that these forms are at present of no value except to warn botanists of the existence of great deal of variability in the species. The collector notes that all plants numbered 33578 were growing on rocks.

MALAYA: *Pahang*, Kuala Teku (SEIMUND, 601); Tahan River (RIDLEY on 21–VII–1891). *Johore*, Batu Pahat (RIDLEY in Nov. 1900); Pengaram near Batu Pahat (RIDLEY, 10223); Sungei Pelapah Kiri (CORNER, 33578). *Singapore*, Sungei Bajau (BURKILL, 724); Bukit Mandai (RIDLEY in 1894).

(e) forma **falcatoidea** FURTADO **f. nov.** (= *H. falcata* RIDL.).

Differt a forma *obliquata* lamina lanceolata, parte basali rotundata 4–6–plo breviore quam terminali, apicem versus sensim attenuata, falcata, inæquilatera, acuminata.

This form is hardly distinct from the *obliquata* forms and represents only a transient stage.

MALAYA: *Kedah*, Yan (RIDLEY, in June 1893). *Province Wellesley*, Tasek Glugor (BURKILL, 6602).

(f) forma **acuminata** (RIDLEY) FURTADO **stat. nov.**

H. Griffithii var. *acuminata* RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIV (1905) 177; ENGL. op. cit. (1912) 44.

Herba usque 25 cm. alta. *Petiolus* 12 cm. longus, laminæ equilongus, vel paulo longior. *Lamina* ovata basi rotundata vel rotundato-acuta, apicem versus sensim attenuata, falcata vel non, acuminata, nervis vix conspicuis, 9–12 cm. longa, 4–5 cm. lata.

This form, which like *Kingii* dries brown, might also be a result of a swampy substratum. In shape it approaches very near the *falcatoidea* form, but the leaves here are comparatively smaller and the nerves almost inconspicuous; in texture of the leaves, it is like the *Kingii* form.

BORNEO: Bau (RIDLEY, 11713, Holotype); Mardan (HEWITT on 27–XII–1905).

14. **Homalomena Griffithii** (SCHOTT) HOOK. f. var. **sumatrana** FURTADO **var. nov.**

Differt ab omnibus hujus speciei formis lamina foliorum multo breviore, ambitu oblique ovato, longitudine quam latitudo paulo longiore vel non, basin versus rotundata, ima acuta vel cordulata, apice acuminata. Foliorum ambitu hæc varietas *H. ellipticae* simillima, sed eorum textura nervisque dissimillima.

Petiolus 8–12 cm. longus, ad tertiam partem vaginatus. *Lamina* foliorum ovato-elliptica, 9–11 cm. longa, 6.5–9 cm. lata, nervis primariis utrinsecus 4–6.

SUMATRA: Soengei Koermian (BÜNNEMEIJER, 3254, Holotype, HB). Ramboetan (BÜNNEMEIJER, 3239, HB); Batoe Island (RAAP, 117, HB).

15. **Homalomena Hendersonii** FURTADO **spec. nov.**

Ab omnibus *Homalomenae* Sect. *Chamaecladonis* speciebus hæc species spathis papyraceis utrinque longe attenuatis, apicem versus sensim acuminatissimis duplo longioribus quam spadix; inflorescentia mascula femineæ æquilonga, conspicue obovata, facile distingui potest.

Herba erecta, in sicco ad 40 cm. longa. *Petiolus* flaccidus virescens, ad medium vel ad quartem partem usque vagina virescente præditus, quam lamina sesque longior, 9–18 cm. longus. *Lamina* foliorum papyracea, ellipticolanceolata, utrinque attenuata, interdum inæquilatera, apice sensim vel abrupte acuminata, interdum falcatula, maxima latitudine ad medium vel infra sita, 10–15 cm. longa, 3.5–6 cm. lata, supra atroviridis, subtus pallidior; nervis lateralibus primariis utrinsecus 4–5, secundariis gracillimis, pluribus, parallelis. *Pedunculi* plures, graciles, 4–6 cm. longi. *Spatha* papyracea, 2.5–3.5 cm. longa, 6–8 mm. ampla, utrinque attenuata, maxima amplitudine in medium sita, apice sensim longe cuspidato-acuminata, quam spadix duplo longior. *Spadix* basi in spatham decurrens, subsessilis, fertilis circa 1.5 cm. longus, parte mascula obovata, quam feminea crassiore, femineæ æquilonga. *Pistilla* ovata, apice in stigma orbiculare subito contracta, 2–4 locularia, ovulis paucis ad loculi basin insertis.

In the shape of the spathe and in the ratio of its length to that of the spadix, the species could be said to be a very near ally of *H. deltoidea.*

In the nervation of the leaves and in the size and the shape of the spadix which is very enlarged and rounded in the apical portion and very short in comparison to the enclosing spathe, this species reminds one of the genus *Piptospatha,* but the apical portion of the spathes is not deciduous as in that genus.

The leaves and the petioles are very soft to the touch and their surfaces are very dull.

MALAYA: *Kelantan,* Sungai Nenggiri, on the track to Kuala Betis (HENDERSON, 29663).

16. Homalomena humilis (JACK) HOOK. f. *sensu latissimo.*

This species is extremely variable, most of the variations being due to both age and environment. Forms differing in colour, shape and size and even in leaf venation may be found among the plants collected from one and the same patch of ground and even in the same plant. The extreme forms appear to be very distinct, but the transitions are so very gradual that it is impossible in many cases to arrange the variations into clearly delimited varieties.

In adopting the names for the varieties and forms described below I have followed the principle I expounded previously in this *Bulletin* (IX, 1937, p. 342) that any varietal name given to the type form of a species and retained as a variety of the same species is wrong in principle and therefore has no claim to be included in priority considerations.

(a) Eu-humilis.

H. humilis (JACK) HOOK. f., Fl. Brit. Ind. VI (1893) 533 quoad basinym tantum; RIDL., Mat. Fl. Mal. Pen. III (1907) 25; ENGL. in Pflanzenreich iv. 23. Da [55] (1912) 49; RIDL., Fl. Mal. Pen. V (1925) 105: omnino pro parte typica.

H. humilis var. *velutina* (HOOK. f.) RIDL., Mat. cit. (1907) 25; ENGL. in op. cit. p. 49 fig. 28; RIDL., Flor. cit. (1925) 105. *Syn. nov.*

H. pygmaea sensu ENGL. op. cit. p. 35 pro parte.

H. velutina SCORT. ex. HOOK. f., op. cit. (1893) 534. *Syn. nov.*

Calla humilis JACK. in Malay Misc. I (1820) 22: *Basinym.*

Chamaecladon humile (JACK) MIQ., Fl. Ind. Bat. III (1856) 213: SCHOTT, Prodr. (1860) 315; ENGL. in DC., Mon. Phan. II (1879) 345 p.p., et Illustr. Exsic. No. 104: *Isonym.*

JACK described his species thus: "A small stemless plant ..... *5 or 6 inches in height* .... *Leaves* elliptic, *ovate,* rather *obtuse* with a subulate acumen, *slightly cordate* at the base ..... crisped margin, smooth and green above, *somewhat hoary beneath, with villous papillae.* Petioles shorter than the leaves ..... Spathes of an obscure red colour."

In this extract I have italicized those parts in JACK'S original description which clinch the identity of *Calla humilis* with the plant that passes as *H. velutina.* The plant that commonly passes as *H. humilis* are either some forms of *H. velutina* or of *H. pumila* (= *H. humilis* var. *pumila*) which have long petioles. The *eu-humilis* forms are variable as to the dimensions of the leaves. See also my remarks under *H. humilis* var. *pumila.*

MALAYA: *Penang,* Government Hill = Penang Hill (RIDLEY, 7033; CURTIS, II–1892; X–1889; XI–1898); Western Hill (HENDERSON, 21354). *Perak,* Lumut (RIDLEY, 10327; in III–1896); Gunong Batu Puteh (WRAY, 1034); Tapah (RIDLEY, 14031); Taiping Hills near Waterfall (RIDLEY, 2952; in 1902; CURTIS in IX–1889 and X–1892); Gunong Keledang (RIDLEY in 1898); loc. incert. (SCORTECHINI, 276b) *Selangor,* Bukit Kutu (RIDLEY, 7665); Kuala Lumpur (RIDLEY, 13399); Rantau Panjang (HUME, 7598); Pahang Track (RIDLEY in 1897); Ginting Bidai (RIDLEY in May 1896); Petaling (RIDLEY, 10177); Ginting Simpak (HUME, 9549); Klang Gates (HUME, 7099; RIDLEY, 13398); Batu Caves (RIDLEY, 23–VI–1899); Bukit Kuda (RIDLEY, 23–VI–1889). *Pahang,* Fraser Hill (NUR, 11037).

SUMATRA: *Batu Island* (RAAP, 412, HB).

ANAMBA ISLANDS: Siantan (VAN STEENIS, 1445, HB).

17. **Homalomena humilis** (JACK) HOOK. f. var. **major** (HASSK.) FURTADO **comb. nov.**

Aglaonema ? *pygmaeum* sensu HASSK. Cat. Hort. Bogor II (1844) 57 et Pl. Jav. Rar. (1847) 154 p.p.; ZOLL., Syst. Verz. (1854) 76.

A. ?*pygmaeum* var. *majus* HASSK. in HOEV. et DE VRIESE, Tijdschr. IX (1842) 161: *Basinym.*

Chamaecladon lanceolatum MIQ., in Bot. Zeit. (1856) 564 et Fl. Ind. Batav. (1856?) 212 t. 40; SCHOTT, Gen. Aroid. (1858) t. 60 fig. 1–26, Prodr. (1860) 313.

C. pygmaeum (HASSK.) ENGL. in DC., Mon. Phan. II (1879) 345 et Arac. Exsicc. et Illustr. n. 96 p.p.

H. pygmaea sensu ENGL. in Pflanzenreich IV. 23. Da [55] (1912) 24 p.p.

As defined here, this variety and the following subvariety become confined to Java only, the records for outside Java being due to the misinterpretation of *A. pygmaeum* and of its var. *majus.*

It is impossible to distinguish this and the following subvariety on the red colour alone, because one individual form may vary in the presence and intensity of the colouration in its different parts.

This variety is distinguished from the Malayan varieties of *H. humilis* in its leaves being much narrower and comparatively longer (3–4 times as long as broad), widest in the middle or in the upper half, with the principal veins running at about 30°, as well as in the leaves being more distantly placed on a scandent or almost erect stem. On the habit of the stem, and on the arrangement of the leaves on it, the herbarium specimens of this Javanese variety look very much like those of the Malayan varieties *ophirensis* and *undulata*.

The petioles are subequal or longer than the lamina. The ovules are situated a little higher than the base of the placenta in the examined specimens as described by SCHOTT.

For the original description of this variety, see *H. humilis* var *major* subvar. *coccinea* (v. ALD. v. ROS.) FURTADO.

JAVA: common up to alt. 1000 m. (BACKER; 710; 1633; 4608; 23365; BAKHUIZEN v/D BRINK: 789; 3100; 3615; 3616; 3995; 5029; 11; BEUMÉE, A–337; REINWARDT, 19–a; DE VRIES, 43; KOORDERS: 39695B; 41322B; VAN SLOOTEN, 597; VAN STEENIS, 2439: All in herb. Buitenzorg).

18. **Homalomena humilis** (JACK) HOOK. f. var **major** (HASSK.) FURTADO subvar. **coccinea** (v. ALD. v. ROS.) FURTADO **subvar. nov.**

Aglaonema ? pygmaeum HASSK., Diag. nov. (1842) 39, in HOEV. et DE VRIESE, Tijdschr. IX (1842) 161, et Cat. Hort. Bogor. II (1844) 57, et Pl. Jav. Rar. (1847) 154 p.p. *Syn. nov.*

A. pygmaeum var. *purpurascens* ZOLL., Syst. Verz. (1854) 76 *nom. nud.*

Chamaecladon lanceolatum var. *purpurascens* (ZOLL) MIQ., Fl. Ind. Bat. III (1856?) 213 *nom. nudum.*

Ch. purpurascens SCHOTT. in Bonpl. (1858) 369, Prodr. (1860) 313. *Syn. nov.*

Ch. pygmaeum (HASSK.) ENGL. in DC, Mon. Phan. II (1879) 345 et Arac. Exsicc. Illustr. No. 96. *Syn. nov.*

Ch. pygmaeum var. *purpurascens* (SCHOTT) ENGL. in DC., Mon. Phan. II (1879) 345. *Syn. nov.*

Ch. rubescens SCHOTT, Gen. Aroid. (1858) t. 60 fig. 27–37 (prob. lapsus calami pro *Ch. purpurascente*). *Syn. nov.*

H. coccinea v. ALD. v. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 180. *Basinym.*

H. pumila HOOK. f. var. *purpurascens* (SCHOTT) RIDL. in Journ. Bot. XL (1902) 35 et Mat. Fl. Mal. Pen. III (1907) 26 p.p. *Syn. nov.*

H. purpurascens (SCHOTT) HOOK. f., Fl. Brit. Ind. VI (1893) 535 observ. sub. *H. pumila* p.p.,; RIDL., Fl. Mal. Pen. V (1925) 105 p.p. *Syn. nov.*

H. pygmaea (HASSK.) ENGL. in Bot. Jarhb. XXV (1898) 18 *nom. nudum.*, quod basinym non citatum est; Index Kewensis Suppl. (1904) 92; ENGL. in Pflanzenreich 23. Da [55] (1912) 34 p.p. typica *Syn. nov.*

H. pygmaea var. *purpurascens* (SCHOTT) ENGL. in Bot. Jahrb. XXV (1898) 18 *nom. nudum,* quia basinym non citatum est; ENGL. in Pflanzenreich tom. cit. p, 34 p.p. *Syn. nov.*

H. rubrovaginata v. ALD. v. ROS, in op. cit. (1922) 331. *Syn. nov.*

H. rubrovaginata var. *subpurpurea* v. ALD. v. ROS. in op. cit. IV (1922) 332. *Syn. nov.*

From HASSKARL'S original description the subvariety *coccinea* appears to be the type form of *A. pygmaeum.* I transcribe here the description of *A. pygmaeum* and of its var. *majus* as published in HOEV. et DE VRIESE, Tijdschrift IX (1842) 161.

AGLAONEMA ? PYGMÆUM: "Caulescens, caulis erectus, ½–¾ ped. altus, foliorum emarcidorum rudimentis tectus. *Folia oblongo-lanceolata* utrinque acuta apice mucronata, nervosa, nervis subtus prominentibus, *2–3 poll. longa, ¾–1 poll. lata;* petiolus 1–1½ poll. long. teres supra planiusculus, basi vaginans, *vagina marginis rosei,* pedunculi axillares vix pollicares, spatha viridi-alba, ¾ pollices spadicem, superans.

"*β* MAJUS (flores non vidi) differt *foliis majoribus, 4–5 poll. long. 1 ¼ poll. lata,* petiolis 3½ poll. long. supra *atroviridibus lutescentibus.*—Magnopere forma et habitu representat folia Atacciæ integrifoliæ, sed multo (plus duplo) minora."

In this description the italicised portions give the important clues in fixing the identity of the two forms described by HASSKARL.

It is evident from the description that the var. *majus* is the form that passes as *H. pygmaea* and *Ch. lanceolatum;* and it appears that HASSKARL had only very small plants of the *coccinea* form which he referred to the typical *A. pygmaeum.* The *coccinea* form differs from the var. *major* described above in the leaf lamina being shorter, ovate or oblong (not frequently obovate-elliptic), twice as long as broad, the petiole usually longer than the lamina (plants with shorter petioles are also found, especially in the

younger plants), and in possessing more often than the var. *major* red pigments in one part or other of the plant. The angles that the principal leaf veins form with the midrib are also larger and so this form approaches very near the var. *pumila* of the Malay Peninsula. From the last however it is distinguished by comparatively shorter lamina and longer petiole, and also by its long or trailing or almost erect stem. From var. *ophirensis* it differs by its more slender petioles, more numerous leaf-veins, and longer stems and more distant leaves on the stems.

As to the presence of red pigments, this form varies a great deal and a series of deviations from a plant with red in all its parts to one red only in the leaf-sheaths might be found. Red coloured plants are also found in the forms *pumila, eu-humilis,* etc., a reason why the term *purpurascens* has been used so very indiscriminately as to render the use of the epithet at present ambiguous.

JAVA: Alt. 100–600 m: *Batavia* resid. (BAKHUIZEN V/D BRINK: 5028; 5030, paratype of *H. rubrovaginata;* 6390; 7065; 7185; BACKER: 5907; 10271; 31130). *Preanger* (BAKHUIZEN V/D BRINK: 3222 = 172, Holotype of *H. coccinea*). *Bodjonmanik* (KOORDERS, 41580B.). *Bantam* (VAN DER PIJL, 70; BACKER, 7114); Mount Tjikorai, cult. in Hort. Bot. Bogor. sub. no. XI. B.X. 3, meroholotype of *H. rubrovaginata* var *subpurpurea* in Herb. Singapore).

With the exception of the last mentioned all the specimens cited are from the Herb. Bogor. BACKER, 10271 is entirely green.

19. Homalomena humilis (JACK) HOOK. f. var. **ophirensis** (RIDL.) FURTADO **comb. nov.**

H. angustifolia var. *ophirensis* RIDL., Mat. Fl. Mal. Pen. III (1907) 29; ENGL. in Pflanzenreich tom. cit. (1912) 31; RIDL., Fl. Malay Pen. V (1925) 109. *Basinym.*

This differs from var. *pumila* in its long trailing stems and unusually long petioles. The leaves are very variable.

According to a note on the sheet of the Ophir plants by RIDLEY the petioles are red and the long rhizomes grow in the crevices in rocks.

H. Curtisii may be identical with this variety.

MALAYA: *Kedah,* Gunong Jerai (RIDLEY in June 1893). *Pahang,* Fraser Hill. alt. 4000–5000 ft. (BURKILL & HOLTTUM, CF. 7879). *Malacca,* Mount Ophir, streams on Padang Batu (RIDLEY in June 1892 and in Dec. 1898: syntypes of the variety). *Johore,* Gunong Pulai (BEST, 7723).

20. Homalomena humilis (JACK) HOOK. f. var. **pumila** (HOOK. f.) FURTADO **comb. nov.**

Calla angustifolia JACK in Malay Misc. I (1820) 124. *Syn. nov.*

Chamaecladon angustifolium (JACK) SCHOTT in Bonpl. VI (1858) 369, Prodr. (1860) 313; ENGL. in DC, Mon. Phan. II (1879) 344 et Arac. Exsicc. et Illustr. n. 105 (omnino quoad partem typicam). *Syn. nov.*

?Ch. pygmaeum var. *latifolium* ENGL. in Malesia I (1882) 283.

H. angustifolia (JACK) HK. f., F.B.I. VI (1893) 533 p.p.

H. johorensis ENGL. in Pflanzenreich IV. 23. Da [55] (1912) 37; RIDL., Fl. Mal. Pen. V (1925) 106. *Syn. nov.*

H. propinqua RIDL. spec. nov. in Journ. Bot. XL (1902) 35 et Mat. Fl. Mal. Pen. III (1907) 26 (non *H. propinqua* SCHOTT). *Syn. nov.*

H. pumila HOOK. f., Fl. Brit. Ind. VI (1893) 535; RIDL. in Journ. Bot. XL (1902) 35 et Mat. tom. cit. (1907) 26: *Basinym.*

H. pumila HOOK. f. var. *purpurascens* (SCHOTT) RIDL. in Journ. Bot. XL. (1902) 35 et Mat. cit. (1907) 26: quoad specimina malayana.

H. purpurascens (SCHOTT) HOOK. f. op. cit. (1893) 535 observ. sub. *H. pumila, pro. parte.*

H. purpurascens var. *pumila* (HOOK. f.) RIDL., Fl. Mal. Pen. V (1925) 105. *Syn. nov.*

H. pygmaea sensu ENGL. in Pflanzenreich IV. 23. Da [55] (1912) pro parte non typica.

?H. pygmaea var. *latifolia* (ENGL.) ENGL. op. cit. (1912) 36.

H. pygmaea var. *pumila* (HOOK. f.) ENGL. l. cit. Isonym.

H. pygmaea var. *purpurascens* (SCHOTT) ENGL. op. cit. (1912) 36 pro parte non typica.

The binomial *H. purpurascens* was validly published by HOOKER in Fl. Brit. Ind. (1893) though it has been overlooked by most authors and not listed in Index Kewensis.

I have included ENGLER'S variety *latifolia* with some doubt. The bare description given by ENGLER both under *Chamaecladon* and later under *Homalomena* neither distinguishes nor excludes the type form described by ENGLER. From the Malayan specimens cited by ENGLER, I surmise that "2–4 cm." in the description may be a mistake, intended to mean that the petioles are 2–4 times as long as the lamina.

JACK in publishing the name *Calla angustifolia,* gave a very brief description of the species; but since he compared the species with his better described *C. humilis,* the clues for the identification of the former should be found in the description of the latter.

The following pairs of characters furnish important clues in identifying the species:

Calla humilis	*C. angustifolia*
1. "A small stemless plant ...5 or 6 inches in height. Root a leaf-bearing tuber, which sends out numerous long villous fibres. Stem none, except the above-mentioned tuber, which is everywhere invested by sheaths of the petioles."	**1.** "A small plant of the same size and nearly related to the preceding" *i.e. C. humilis.* In the diagnosis in Latin the plant is described as being "acaulis."
2. "Leaves erect .. elliptic, ovate, rather obtuse, with a subulate acumen, slightly cordate at the base ...."	**2.** "leaves radical..... lanceolate, acute at both ends."
3. "Foliis ellipticis, supra glabris."	**3.** "Foliis lanceolatis utrinque acutis glabris."
4. Peduncle 4–5 axillary, 1-flowered, shorter than the petioles.	**4.** Peduncle 4–5 axillary, 1-flowered, shorter than the petioles.
5. "Spathes of an obscure red colour...."	**5.** "Flowers, etc. exactly in the preceding."
6. "Petioles shorter than the leaves...."	**6.** "These two [species] are so closely allied that it is doubtful whether they might not be considered varieties."

From this comparison I conclude that JACK'S *C. angustifolia* is a plant very near in general appearance to his *C. humilis* [see my remarks under *H. humilis* (eu-Humilis)], being stemless, about 5–6 inches in height, having a reduced leaf-bearing tuber or root, and obscurely red spathes; but differing from *C. humilis* in having leaves which are lanceolate in shape, acute at both ends and glabrous on both sides (*C. humilis* being described as ovate, slightly cordate at base, crisped in the margins, hoary beneath with villous papillæ).

Surely this description cannot be applied to *H. angustifolia* as currently interpreted, which has a long prostrate, trailing stem, petiole as long as, or even longer than, the lamina, leaves very narrow, almost linear (not lanceolate in the older sense), though attenuate at both ends, rarely reddish spathes, and with a height varying from 8 to 18

inches. Perhaps when *C. humilis* was identified with longer-petioled and taller forms of the species and the smaller forms were described as new, one was justified in giving *C. angustifolia* the current interpretation. But when it is shown that *C. humilis* is really identical with *H. velutina,* it ought to be clear that *C. angustifolia* is the Malayan form that passes under the different names of *H. pygmaea, H. purpurascens* or *H. pumila.*

All the characters given by JACK best fit with the smaller forms of this plant (*H. pumila*) which is also one that can be said to approach very near to *C. humilis* as interpreted here. MIQUEL (Fl. Ind. Bat. III, 1856 ?, p. 213) appears to have suspected the correct affinity of the species.

There is a good deal of variation within this variety; some plants have long petioles (2–4 times as long as the lamina) and a very broad lamina (these forms may be identical with *H. pygmaea* var. *latifolia* ENGL), some are quite small, even smaller than those described by JACK; some are red all over, others are red in some parts only, different plants having different degrees of redness distributed in different parts. There is no evidence to consider the various forms from the Malay Peninsula agreeing with ENGLER'S varieties *purpurascens, pumila* and *latifolia* to be other than ecologic forms within the same variety.

H. johorensis ENGL. (=*H. propinqua* RIDL., non SCHOTT) is also a larger form of this variety, and transitions from the typical *pumila* to the *johorensis* forms occur.

MALAYA: *Kedah,* Gunong Jerai (Kedah Peak), alt. 3000–4000 ft. (ROBINSON & KLOSS, 6123). *Perak,* Bukit Kapayang (RIDLEY in 1904); Tambun (BURKILL, 6304); Ipoh (BURKILL, 2559; CURTIS, XII–1895; RIDLEY, 11932); Taiping Hill (RIDLEY, 11421); loc. incert. (SCORTECHINI, 276b, HB; sn.). *Pahang,* Sungei Sat at Ulu Tembeling (HENDERSON s.n. 20–VII–1929); Robinson Falls on Cameron Highlands, alt. 4800 ft. (HENDERSON, 17758); Telom (RIDLEY in Nov. 1908). *Negri Sembilan,* Gunong Angsi, 700–2000 ft. (NUR, 11605). *Johore,* Mount Austin (RIDLEY, 11990); Batu Pahat (RIDLEY, 11193); Pulau Tinggi (BURKILL, 918); Gunong Panti (CORNER, 30691): Gunong Lambak (HOLTTUM, 9391); Pulau Aor (HENDERSON, 18374); Gunong Pulai (RIDLEY; 12144 & in Dec. 1904; MAT, 3722, Holotype of *H. johorensis*). *Malacca,* Ayer Panas (HERVEY in 1891); loc. incert (RIDLEY). *Singapore,* Bukit Timah (RIDLEY in 1889; Sept. 1890; and in 1894; NUR in Sept. 1932); Seletar (RIDLEY in 1889); Reservoir Woods (RIDLEY in 1893).

SUMATRA: *Lingga Island* at Sungei Ṭanda (TEYSMANN, HB); Gunong Paliwang in Pelamban (VAN STEENIS, 3794, HB); Asan Pulau (LATIF, 8, HB).

BORNEO: Bidi (ANDERSON, 85; BROOKS, A–4); Matang (RIDLEY in 1904); Tadjoek (JAHERI, 215, HB); Kinabalu Mountain Range, alt. 2500–4000 ft. (CLEMENS: 26199; 27230; 29139; 32508, HB); Koetai (ENDERT, 2360, HB).

21. **Homalomena humilis** (JACK) HOOK. f. var. **undulata** RIDL., Fl. Malay Pen. V (1925) 105.

H. pumila HOOK. f. sensu RIDL. in Journ. F. M. S. Mus. IV (1909) 90.

H. pygmaea sensu ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 34 pp.

?H. repens RIDL., Fl. Malay Pen. V (1925) 106.

H. undulatifolia RIDL. (errore typ. *undalatifolia*) in Journ. Roy. Asiat. Soc. Straits Br. LVII (1907) 111 et Fl. Mal. Pen. V (1925) 106. *Syn. nov.*

This form is very rare and approaches var. *major* of Java. *H. undulatifolia* is only a small plant flowering but not yet fully developed. I have not seen the holotype of *H. repens*, but from the description it appears to be this, unless it is a form of var. *ophirensis*, which is also very close to this variety.

MALAYA: *Perak*, Sungei Kertai at Temango (RIDLEY, 14304: Holotype of *H. undulatifolia*). *Pahang*, Telom (RIDLEY: XI–1908; 13842 & 13842a, Syntypes); First Padang Stream (RIDLEY in 1911): Gunong Tahan (RIDLEY, VI–1911, Syntypes). *Johore*, Sednah (RIDLEY, 13469); Sungei Tebrau (RIDLEY, III–1908).

The following specimens, some of which are cited by ENGLER (1912) under *H. pygmaea*, either belong here or are forms of *H. humilis* var. *pumila:*

BORNEO: Sibaloum (TEYSMANN, 10826, HB).

SUMATRA: Talaman (BÜNNEMEIJER, 584, HB); Gajoe (DAALEN 30, HB).

CELEBES: Minahasa (KOORDERS 16180β, HB); Kendari (KJELLBERG, 612, HB); Pangkadjene (TEYSMANN, 12421, HB).

22. **Homalomena Kiahii** FURTADO **spec. nov.**

Herba majuscula, erecta (sine caudiculo infrafoliari ad 10 cm. usque longo, radices plures geopetentes gerente), a basi ad foliorum summum usque 15–20 cm. longa. *Petiolus* 5–9 cm. longus, quam lamina brevior, ad mediam partem usque vagina rubescente conspicua præditus. *Lamina* foliorum papyracea, ovato- ad oblonga-lanceolata, inæquilatera, apicem versus quam basin magis attenuata, 10–15 cm. longa, 3–4 cm. lata, maxima latitudine prope mediam vel infra sita; basi rotundata vel subtruncata, imo obtusa vel in uno latere acutiuscula; apice acuminata interdum falcatula, summo mucronulata; supra viridis, subtus pallidior; nervis lateralibus primariis utrinsecus 5–7, primariis subprimariis-que cunctis 6–9, alteris pluribus, subparallelis, gracillimis. *Pedunculi* plures, tenues, reflexi vel erecti, 2–3 cm. longi. *Spatha* 15–25 mm. longa, convoluta, subcylindrica, in medio haud constricta, chartacea, apice breviter vel obscure cuspidata. *Spadix* stipitatus, spathæ tubo fere æquilongus, masculus 2–2½–plo longior quam femineus. *Pistilla* subglobosa apice in stigma orbiculare concavusculum contracta; ovulis paucis, ad ovariæ basin insertis.

This species is very near *H. argentea* RIDL., from which it is easily distinguished in papyraceous (not coriaceous) leaves and spathes, ovate or oblong-lanceolate (not obovate or obovato-lanceolate) leaf-lamina, more numerous, and longer peduncles, longer spathes, and longer portion of the spadix occupied by female flowers.

MALAYA: *Johore*, Sungei Kayu, on a hill (KIAH, 32358).

22. **(b) forma maculata** FURTADO **f. nov.**

Differt a forma typica lamina in utroque latere inter costam marginemque tæniis argyræis nota.

In Aroids red and white markings are often a transient, non-hereditary response to environment. KIAH'S collection 32146 cited below shows that some specimens of the same collection do not have the markings. Hence this form with maculate leaves cannot be regarded as a stable form or a variety.

MALAYA: *Johore*, Sungei Kayu in swamps (KIAH, 32146, Holotype); Sungei Pelepah Kiri, on a hillside, not in stream-beds (CORNER, 33579).

23. **Homalomena Korthalsii** FURTADO **nom. nov.**

H. subcordata (SCHOTT) ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 51 (non *H. subcordata* ENGL., 1882). *Isonym.*

Chamaecladon subcordatum SCHOTT in MIQ., Ann. Mus. Lugd. Bat. I (1863–1864) 348. *Basinym.*

The new combination *H. subcordata* (SCHOTT) ENGL. (1912) was made on the mistaken supposition that *H. subcordata* ENGL. (in Bot. Jarhb. I, 1882, p. 183 and in Malesia I, 1882, p. 281) was invalid or illegitimate and that the new combination could be legitimized. The new Rules of Botanical Nomenclature render the new combination illegitimate because of the earlier binomial *H. subcordata* ENGL.

BORNEO: (KORTHALS, Herb. Leiden: non vidi).

24. **Homalomena lancifolia** HOOK. f., Fl. Brit. Ind. VI (1893) 533; RIDL., Mat. Fl. Mal. Pen. III (1907) 29; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 47 fig. 26 A-J; RIDL., Fl. Malay. Pen. V (1925) 109.

H. Griffithii sensu BURKILL et HANIFF in Gard. Bull. Straits Settl. VI (1930) 266.

I have not seen the type of this species and so have followed the interpretations of the species as indicated by the determinations of PRAIN, RIDLEY and ENGLER, in the Herbarium of Singapore.

H. batoeensis ENGL. may prove to be a form or variety of this.

MALAYA: *Kelantan*, base of Bukit Papan (HENDERSON, 29564). *Pahang*, Batu Talam in Raub (BURKILL & HANIFF, 16974, as Rumput Gatal), Bentong on Raub boundary (FURTADO, 33106); Kota Glanggi

(RIDLEY, VIII–1891); Tahan River (RIDLEY, VIII–1891). *Perak*, Gunong Batu Puteh, alt. 6700 ft. (WRAY, 385). *Selangor*, Ginting Simpah (HUME, 8975); Pahang track (RIDLEY, 8462).

25. **Homalomena mentawiensis** FURTADO **spec. nov.**

"*H. lanceolata* MIQ." ex RIDL in Kew Bull. (1926) 92 nomen tantum.

H. humili var. *pumilae* valde affinis, sed foliorum lamina lanceolata, subtus nervis validioribus, spathis pedunculisque minoribus facile recognoscenda. Ab *H. humile* var. *majore* recedit herba erectiuscula minore, foliis in turione aggregatis, haud distantibus, petiolo quam lamina subduplo breviore, lamina semper oblanceolata, subtus nervis validioribus, spathis pedunculisque minoribus. Ab *H. paucinervia*, cui facie simillima, differt herba minore, pedunculis spathisque multo brevioribus.

Herba ad 12 cm. longa, foliis in turione aggregatis. *Petiolus* 1.5–2.5 cm. longus, ad tertiam partem usque vagina inconspicua, probabiliter rubescente, præditus. *Lamina* foliorum oblanceolata, coriacea, 3–5 cm. longa, 1–1.5 cm. lata, supra atroviridis, subtus pallidior, nervis supra inconspicuis, subtus prominentibus, primariis subprimariisque cunctis utrinsecus 5–7. *Pedunculus* gracilis, inconspicuus, vix 1 cm. longus. *Spatha* perbrevis, 4–6 mm. longa, ovata, apice acuminata vel acuta. *Spadix* spathæ subæquilongus, tertia parte femineus.

Apparently RIDLEY intended the name *H. lanceolatum* to be an isonym of *Chamaecladon lanceolatum* MIQ., but since no basinym was indicated the name cannot be taken as validly published.

MENTAWI ARCHIPELAGO: Sipora (BODEN KLOSS, 14777, Holotype in Herb. Singap. duplicate in HB; IBOET 512, Paratype).

26. **Homalomena mixta** RIDL. in Journ. Bot. XL (1902) 36; RIDL., Mat. Fl. Mal. Pen. III (1907) 30; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 80; RIDL., Fl. Malay Pen. V (1925) 110 p.p.

This differs from all other species in the genus in having pistillodes in the male portion of the spadix. The specimen itself may be abnormal, but in vegetative characters the specimen does not match any other species of the genus. The nearest allies in leaf characters appear to be *H. oblanceolata* and *H. rupicola*, both described from Sumatra.

The following will complete the description given of the species:

Pistilla ovoidea, in stigma discoideum abrupte contracta. *Pistillodia* linearia, masculis floribus (inter quos sita) duplo longiora.

MALAYA: *Pahang*, Tahan woods (RIDLEY in 1891, Holotype).

27. **Homalomena montana** FURTADO **spec. nov.**

Herba reptans ut videtur, caudiculo foliifero brevi. *Petiolus* laminæ æquilongus vel quam lamina sesqui-longior ad tertiam vel quartam partem vagina rubescente præditus, 16–25 cm. longus. *Lamina* foliorum nitida, coriacea, elliptico-lanceolata, interdum inæquilatera, maxima latitudine in medium sita, utrinque sensim attenuata, basi acuta vel rotundato-obtusa, apice longe acuminata, 14-20 cm. longa, 4–6 cm. lata; nervis lateralibus primariis utrinsecus 5–7 (nervis primariis subprimariisque cunctis 9–13), angulo 60°–40° arcuatim adscendentibus; secundariis pluribus, subparallelis; omnibus conspicuis. *Pedunculi* plures, graciles, 4–8 cm. longi. *Spatha* cum acumine 2–5 mm. longo 1.8–2.5 cm. longa, coriacea vel semi-coriacea, in latere dorsali decurrens. *Spadix* spathæ tubo fere æquilongus, basi breviter stipitatus, fertilis ad 1.8 cm. longus, parte mascula quam feminea triplo longiore. *Pistilla* ovoidea, apice stigmate discoideo coronata, 3–4 locularia, ovulis perpaucis ad basin loculi insertis.

In the general texture and size of the leaves this species might be confused with some forms of *H. Griffithii*, but the spadix of *H. montana* is shorter and has its male portion three times as long as the female; the leaves, which are more coriaceous, are neither falcate nor ovate. From *H. Hendersonii* it differs both in the leaves which are nitid and more coriaceous and have the veins very prominent underneath, and in the spadix which is nearly as long as the spathe tube, with the male inflorescence cylindric and three times as long as the female.

MALAYA: *Trengganu*, Gunong Padang. alt. circa 4000 ft. (MOYSEY & KIAH, 31839).

Probably here also belongs NUR 11091 collected at Fraser Hill along Sungei Yet in Pahang, and cited in RIDLEY'S Flora under *H. mixta*. This collection has been attributed by RIDLEY to BURKILL under whose direction NUR then worked as plant-collector.

28. **Homalomena nigrescens** (SCHOTT) ENGL. in Pflanzenreich IV. 23. Da [55] (1912) 81 inter species dubias vel imperfecte cognitas collocata.

Chamaecladon ? nigrescens SCHOTT in MIQ., Ann. Mus. Lugd. Batav. I (1863) 126; ENGL. in DC, Mon. Phan. II (1879) 349. *Basinym.*

KORTHAL'S n. 221 preserved in the Leiden herbarium is purported to be from the holotype collection of this species. From the fact that SCHOTT did not describe the inflorescence of this species and used moreover a query mark after *Chamaecladon*, I conclude that SCHOTT had only seen sterile duplicate material from this collection.

In the Leiden material the spathes (1 cm. long with a short slender peduncle, both as in *H. humilis*) are represented; they show that the species belongs unmistakably to the section *Chamaecladon.*

In size and general appearance of the leaves the species might be easily confused with *H. Corneri;* however it differs from *H. Corneri* in its much smaller spathes and peduncles and its very much shorter leaves which are less rounded but slightly cuneate at base, less coriaceous and less acuminate at apex, with fewer primary nerves and with more numerous secondary nerves between any two primary ones.

SUMATRA: (KORTHALS, 221, herb. Leid., Haptoholotype).

29. **Homalomena novo-guineensis** ENGL. in Pflanzenreich IV. 23. Da [55] (1912) 47.

ROMER 451 in the Buitenzorg herbarium has been labelled by ENGLER as having been included in the Pflanzenreich, but is not cited there. LAM 722 was referred by VAN ALDERWERELT VAN ROSENBURGH doubtfully to *H. pygmaea* (HASSK.) ENGL. (in Bull. Jard. Bot. Buitenz. IV. 1922 p. 332); from this *H. novo-guineensis* is easily distinguished by more coriaceous, often oblanceolate leaves with the base somewhat longer on one side than on the other, and by longer peduncles. In LAM 722 the leaves are narrower in the lamina and shorter in the petiole than the ones in the type collection; but this appears to be only a transient stage of the same species.

NEW GUINEA: *Southern districts* [? South of Wilhelmina Peak] (ROMER, 451, flowers, 7–X–1909, Haptoholotype, HB); *Northern Districts:* Pionier Bivak, alt. 10 m. (LAM, 722, flowers, 29–VII–1920, HB).

30. **Homalomena nutans** HOOK. f., Fl. Brit. Ind. VI (1893) 535; RIDL., Mat. Fl. Mal. Pen. III (1907) 27; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 37; RIDL., Fl. Malay Pen. V (1925) 108.

H. purpurascens sensu BURKILL et HANIFF in Gard. Bull. Straits Settl. VI (1930) 266.

H. Scortechinii HOOK. f. sensu RIDL. in Journ. Roy. Asiat. Soc. Str. Br. LVII (1910) 112; RIDL., Fl. cit. (1925) 105. p.p.

This species was so far known only from the holotype collection, of which I have not seen any representatives. My identification of the species is based entirely on the description. This species is the only one in the genus that produces spathes cernuous as in *Piptospatha.*

BURKILL and HANIFF record that the Sakais drink a preparation of this plant as a cure for loss of voice.

MALAYA: *Kelantan,* Sungei Ketil at Gua Musang (HENDERSON, 22659). *Pahang,* Batu Talam in Raub (BURKILL & HANIFF, 16951, Sakai name, Gli). *Perak,* Temango (RIDLEY, 14367).

31. **Homalomena oblanceolata** V. ALD. v. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 170.

The variations within this species have to be studied in order to see whether it is really distinct from *H. rupicola* V. ALD. v. ROS. (op. cit. p. 179).

SUMATRA: Deli (cult. in Hort. Bot. Bogor. sub. n. XI. B.X. 47, HB, Holotype); Sibolangit (NUR, 7367).

Here may also belong the following Sumatran collections: LÖRZING & JOCHEMS, 7380, HB; GALOENGI, 172, HB).

32. **Homalomena paucinervia** RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIV (1905) 175; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 34; MERR., Enum. Bornean Pl. (1921) 95.

H. angustifolia sensu RIDL., Mat. Fl. Mal. Pen. III (1907) 28; ENGL. op. cit. (1912) 46; RIDL., Fl. Mal. Pen. V (1925) 108; omnino pro parte.

H. lucidula V. ALD. v. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 171. *Syn. nov.*

Piptospatha Ridleyi var. *lanceolata* RIDL., Fl. Mal. Pen. V (1925) 114 p.p. *Syn. nov.*

This species very much resembles *H. confusa* which however is distinguished by its longer spathes, frequently longer petioles, and shorter lamina, and prostrate stems.

The species was based on a Bornean plant having leaves thin almost chartaceous, but transitions from this to thickly coriaceous, as represented by some Anambas specimens, are seen.

H. consobrina is very near this and further investigations are necessary to see whether it is identical with *H. paucinervia.*

RIDLEY'S *Piptospatha Ridleyi* var. *lanceolata* was based on a mixture consisting of typical *P. Ridleyi* and of *H. paucinervia* collected by HOLTTUM at Ulu Kahang sub no. 10863).

MALAYA: *Johore,* Gunong Panti (RIDLEY, XI–1892; CORNER, 5–XII–1936); Gunong Muntahak (HOLTTUM, 19933); Ulu Kahang (HOLTTUM, 10863 partim).

SUMATRA: Deli (cult. in Hort. Bot. Bogor. sub. n. XI. B.X. 13; Holotype of *H. lucidula,* HB); Lampongs (VOOGD, 321, HB).

ANAMBAS ISLANDS: Jemaja (HENDERSON, 20389); Siantan (HENDERSON, 20105; VAN STEENIS, 687).

BORNEO: *Sarawak,* Matang (RIDLEY, Holotype).

33. **Homalomena Pulleana** ENGL. et. Krause in Engl., Bot. Jahrb. LIV (1916) 84; KRAUSE et V. ALD. v. ROS. in Nova Guinea XIV (1927) 217.

From the description and the plate of *H. Lauterbachii* in ENGL., Pflanzenreich IV. 23. Da. (1912), *H. Pulleana* appears to be only a smaller spathed form or variety of the former.

NOVA GUINEA: Mount Perameles, alt. 1100 m. (PULLE: 398, HB, Type of *H. Pulleana;* 410, HB).

34. **Homalomena refulgens** V. ALD. V. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 174.

H. Burkilliana RIDL. in Journ. Roy. Asiat. Soc. Malay Branch I (1923) 104. *Syn. nov.*

SUMATRA: Sibolangit (DOCTERS VAN LEEUWEN, cult. in Hort. Bot. Bogor. sub XI. B.X. 50: Meroholotype in Herb. Singap.; NUR, 7412: Isoholotype of *H. Burkilliana*).

35. **Homalomena Scortechinii** HOOK. f., Fl. Brit. Ind. VI (1893) 534; RIDL., Mat. Fl. Mal. Pen. III (1907) 29; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 31 fig. 14; RIDL., Fl. Malay Pen. V (1925) 109. p.p.

H. crassa RIDL. in Journ. Bot. XL (1902) 36; RIDL., Mat. Fl. Mal. Pen. III (1907) 29; ENGL. op. cit. (1912) 37; RIDL., Fl. Mal. Pen. V (1925) 109. *Syn. nov.*

This species varies a great deal in the length of the petioles and in the size of the leaves. *H. crassa* represents a form with very short petioles. The typical *H. Scortechinii* has petioles nearly equal to, or slightly longer or shorter than, the lamina.

MALAYA: *Perak,* Ulu Bubong (KUNSTLER = KING'S collector, 10603, Haptoholotype). *Selangore,* Kajang (RIDLEY, V–1896); Ginting Peras (RIDLEY, V–1896) (both these Selangor specimens are syntypes of *H. crassa*). *Negri Sembilan,* Bukit Plangi in Tampin (BURKILL, 2544). *Johore,* Tebrau River (RIDLEY, 13237); Castlewood (RIDLEY, in 1906).

Probably CORNER 33685 from Johore belongs here.

B. SECTION: EU-HOMALOMENA

36. **Homalomena alba*** Hassk., Decades (1842) 59 et in HOEV. et DE VRIESE, Tijdschrift IX (1842) 162, et in Cat. Hort. Bogor. II (1844) 57; SCHOTT, Synops. Aroid. (1856) 118; MIQ., Fl. Ind. Bat. III (1856?) 211; SCHOTT, Prodr. (1860) 312; ENGL. in DC., Mon. Phan. II (1879) 339 et in Pflanzenreich IV. 23. Da. [55] (1912) 63; V. ALD. V. ROS. in Bull. Jard. Bot. Buitenz.

* Since writing the above I have had the opportunity of consulting HOUTTUYN'S description and plate of *Dracontium cordatum* HOUTT., Handleit. XI (1779) 200 t. 71 fig. 2 (non AUBL., 1775) as reproduced in the German edition of the work by CHRISTMANN and PANZER (Pflanzensyst. X, 1783, p. 151 t. 71 fig. 2), a work then not available for reference in Singapore; and, as a result of this, I conclude that *D. cordatum* HOUTT. is identical with *Homalomena alba* HASSK. as interpreted here. Not only is the type of HOUTTUYN'S species from Java, but the figure given agrees very well with the specimens described as *H. javanica.* In view of this the correct name for the species is *H. cordata* (HOUTT.) SCHOTT, Melet. I (1832) 20; Kunth, Enum. III (1841) 57; MIQ., Fl. Ind. Bat. III (1856?) 211; Engl. in Pflanzenr. IV. 23. Da. [55] (1912) 57 p.p. The correct name for the Moluccan species referred by ENGLER (*l.c.*) and others to *H. cordata,* should be *H. Gaudichaudii* SCHOTT in MIQ., Ann. Lugd. Bat. I (1863) 280.

IV (1922) 187: omnino quoad partem typicam javanicam (excl. planta amboinica).

H. cordata SCHOTT sensu ZOLL. Syst. Verzeich. (1854) 75, MIQ., Fl. Ind. Bat. III (1856?) 211.

H. discolor v. ALD. v. ROS. op. cit. (1922) 185. *Syn. nov.*

H. javanica v. ALD. v. ROS. op. cit. (1922) 183. *Syn. nov.*

H. javanica var. *kangeanensis* v. ALD. v. ROS. op. cit. (1922) 185. *Syn. nov.*

H. palliformis v. ALD. v. ROS. op. cit. (1922) 182. *Syn. nov.*

H. Zollingeri SCHOTT in Bonpl. (1859) 30 et Prodr. (1860) 309.

Evidently as a consequence of HASSKARL'S having given a very brief description of the species and not having preserved the types, *H. alba* has had a very chequered career. The species was first published in 1842 in the Tijdschrift (of which separates with independent paging appears to have been issued in advance as Decades or Diagnoses) and later in Cat. Hort. Bogor. From the references made in the descriptions published in the Tijdschrift, it appears that this Catalogue was ready in manuscript form when the Decades were being published. The description given in 1842 runs thus:—

"HOMALONEMA [= Homalomena] ALBUM mihi.

"cf. ibidem [= Cat. Hort. Bogor.] 305: 1 (5) et RUMPH. H. Amb. V. 322 t. 111. 2 ubi descriptio bona. Petioli 3–3½ ped. longi, basi diametro 1–1½ poll. folioli lamina juxta nervum medium pedali lobi 5–6 poll. long. latitudo pedalis, spatha 3 poll. long. Sapdix inodorus."

In Catalogus (1844) p. 57 under the specific no. 1 of the genus numbered 305 we find the following:

"*H. album* HASSKL. (3) (Dracunculus amboinicus RUMPH. Amb. V. t. 111. 2) *Tjarieang boddas* (album)."

The number (3) immediately after the name of the author of the species refers to the following description given as a footnote:

"Caulescens foliis cordato-ovatis mucronatis atroviridibus, lobis baseos parallelis, petiolis viridibus, spatha spadice vix breviore mucronata viridi alba, margine alba."

Since both these descriptions are very brief and there are no type specimens, it is worth while considering the description given by RUMPHIUS, which was considered by HASSKARL as being "descriptio bona" of his species. RUMPHIUS described three forms under *Dracunculus amboinicus*, namely: (1) *Anappur nigra*, seu *mas*, (2)

Anappur alba seu *femina*, and (3) *Anappur rubra*. The description of *Anappur nigra* may be re-stated thus to conform with current terminology:

> *Folia* rotundato-cordiformia, basi profunde cordata, viridia, glabra, splendentia, 9–10 poll. longa, latitudine quam longitudo sua vix breviora; in apicem brevem terminata, ad insertionem petioli nervis 7–9 gerentia, quorum maximus (costa media) recte excurrit ad finem et ad latera alios emittit; alii vero laterales nervi incurvis decurrent finibus ad oras; supra nervis depressis subtus prominentibus. *Petioli* 2–2½ ped. longi, pallidi-virentes. *Cataphylla* semi-pedem longa, ac pollicem lata, bicarinata (?), in quorum axilla 4–5 *pedunculos* albicantes gerentia. *Spatha* vix minimum digitum longa et crassa, corniculata, oblonga viridis. *Spadix* masculus digiti articulum longus, flavo cinereus; femineus primum viridis sensim igneus tandem croceus.

The description of *D. amboinicus* (albus) reads thus:

> "Secundo *Anappur alba*, seu femina fere nil differt a præcedenti [=*Anappur nigra* seu *mas*] sua forma, ... hac in re autem optime distingui possunt, quod *feminae* folia pallidiora sint, atque in medio lineam habeat flavam, seu albicantem, juxta nervum medium decurrentem".

Further RUMPHIUS has the following additional remarks on these two forms:

> "Alii autem has species ita dividunt. *Anappur mas* longiora, et acutiora gerit folia instar Ari; ..... *Femina* semper rotundiora gerit folia, ac bicolor est, una perfecte viridis gramini coloris .... altera folia gerit pallidiora, et in medio lineam luteam ...."

Now these descriptions of *Dracunculus amboinicus* (*albus*) were based on Moluccan plants; but HASSKARL had found them to be applicable also to the Javanese plants referred by him to *H. alba*. The only species that answers to these descriptions given by RUMPHIUS is *H. alba* as interpreted here. It also produces occasionally white-nerved leaves as may be seen from the following field-notes left by HALLIER on the specimen no. 648:

> "Ziemlich dick, krautig, oberseits glänzend, lebhaft grün, mit helleren gelbgrünen Mittel-und Fieder-nerven und zahlreichen parallelen feinen dunkelgrünen Fieder-nerven; unterseits swach glänzend hellgrün, Nervatur wie auf der oberseite."

Younger forms produce leaves having numerous fine nerves, and it is possible that this was the form that MIQUEL had identified as *H. rubescens* KUNTH (in MIQ., Fl. Ind. Bat.

III) ; for he not only described it as having "venulis tenuissimis densissimis" but distinguished from it *H. caerulescens* as having "venulis quam in *H. rubescente* minus densis."

The dimensions of the spathe given by HASSKARL are 3 poll. for *H. alba* and 2–2½ poll. for *H. rubra*. Now though the spathes in *H. alba* vary but very little, in *H. rubra* they exhibit a great deal of variation regarding the size, some being twice the length given by HASSKARL. These measurements may be one of the reasons why HASSKARL'S two species have not been correctly identified.

JAVA: Gunong Tijbodas (SAPII, 117, Syntype of *H. javanica;* 2000; VAN SLOOTEN, 245, Holotype of *H. discolor;* HALLIER, 648; LÖRZING, 1716, Syntype of *H. javanica*) ; Semarang (BEUMÉE, 5045 & 816: Syntypes of *H. palliformis;* 3897) ; Rembang (BEUMÉE, 5560) ; Preanger (KRAMER, 118) ; Pasir Selama (BACKER, 18750) ; Banean (KARTA, 92) ; Kediri (BACKER, 11275).

KANGEAN ARCHIPELAGO: (BACKER, 27477: Holotype of *H. javanica* var. *kangeanensis;* 29723, 27017).

37. **Homalomena Lindenii** (ROD.) RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIX (1908) 49.

Alocasia ?Lindenii ROD. in Illustr. Hort. (1886) 111 t. 652. *Basinym.*

H. singaporensis REGEL sensu ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 52 excl. parte typica; RIDL., Fl. Malay Pen. V (1925) 110 p.p.

REGEL'S description of *H. singaporensis* was published in "Supplementum ad indicem seminum anni 1868 quæ hortus botanicus imperialis Petropolitanus pro mutua commutatione offert" (1869, p. 18) and reads thus:

> "Petiolis præcipue basin versus rubescentibus, apicem versus olivaceis; folii lamina olivaceo viridi; spadice quam spatha breviore. Cetera ut *H. rubescentis* KUNTH.
>
> "Caulis abbreviatus. Petiolus basi vaginatus, apice teres, circiter ¼ ped. longus. Folii lamina cordato-hastata, plus minus acuminata, circiter 8 poll. longa et 6 poll. lata. Spatha extus virescens intus albida. Spadix inclusus. Staminodia clavat.
>
> "Homalomena spec. e Singapore h. Berol. (RGL.)".

I do not know whether any of the specimens named in the Berlin Herbarium represent the original types studied by REGEL or their duplicates. But from the specimens so named in the Berlin herbarium (examined by me in 1933) and from the provenance and description given by REGEL, I conclude that the name *H. singaporensis* REGEL was based on not fully developed specimens of *H. rubra* (as here interpreted) which have small somewhat deltoid leaves. This may have misled ENGLER to identify *H. singaporensis* with *H. Lindenii*, which, when cultivated in pots, frequently

produces similar leaves, but is known neither to produce reddish petioles nor to grow wild in Singapore, its petioles being yellowish or cream white.

I have not been able to find a record to show that *H. Lindenii* was being cultivated in Singapore previous to 1907, in which year RIDLEY introduced the species from Rangoon, Burma (RIDL., in Journ. Roy. Asiat. Soc., Straits Br. XLIX, 1908, p. 49).

The plant referred to *H. singaporensis* in RIDLEY'S Flora (V, 1925, p. 110) is neither *H. Lindenii*, nor *H. rubra*, but *H. rubescens* (ROXB.) KUNTH. RIDLEY'S assertion that it is a native of Papua is based obviously on ENGLER'S opinion that *H. singaporensis* is identical with *H. Lindenii*. In the Materials (III, 1907 p. 30) RIDLEY recorded the following information concerning the plant cultivated in the Singapore Botanic Gardens under the name *H. singaporensis*:—

> "The plant thus labelled at Kew is a species which has long been cultivated in Gardens at Singapore, the history of which is not known. It is not however a native of the peninsula as far as is known, but is traditionally stated to have originally been obtained from Calcutta. It differs however from REGEL'S description in having the petioles and spathes completely red."

Previously RIDLEY wrote of the same plant thus:—

> "Plants cultivated at Kew under this name [*H. singaporensis* REGEL] which seem to agree with a type in the Kew Herbarium are identical with a plant which has been cultivated in Singapore for very many years, but has never been obtained wild by any collector. It is said to have come from India." (Journ. Bot. XL. 1902, p. 34).

Plants of *H. Lindenii*, *H. rubescens* and *H. rubra*, when grown in pots, very rarely produce large leaves, and herbarium specimens from such plants are not easily distinguished unless their inflorescences are carefully examined. This may explain why *H. singaporensis* has been identified at one time with *H. rubescens* (cf. SCHOTT, Prodr., 1860 p. 310; ENGL. in DC., Mon. Phan. II, 1879 p. 336; RIDLEY, Mat. l.c.) and another time with *H. Lindenii*. (ENGLER, Pflanzenr. cit. p. 52). It may be noted here that the Singapore specimens which were named by RIDLEY as *H. singaporensis* were previously cultivated as *H. rubescens* (see my remarks on *H. rubra*).

NOVA GUINEA: Kataki (CARR, 12603);

38. **Homalomena rubra** HASSK., Decad. (1842) 60, in HOEV. et DE VRIESE, Tijdschrift IX (1842) 162, et Cat. Hort. Bogor. II (1844) 57; SCHOTT in Bonpl. X (1862)

148; ENGL. in DC., Mon. Phan. II (1879) 338 et in Pflanzenreich IV. 23. Da. [55] (1912) 63; v. ALD. v. ROS. in Bull. Jard. Bot. Buit. IV (1922) 187.

H. alba HASSK. sensu v. ALD. v. ROS. *l.c.*

H. aromatica var. *cordata* (SCHOTT) ENGL. in Becc., Malesia I (1877) 282 pro parte non typica; RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIV (1905) 173 p.p.

H. bancana v. ALD. v. ROS. op. cit. (1922) 186. *Syn. nov.*

H. coerulescens JUNGH. ex SCHOTT. Synops. (1856) 119 nomen? (non vidi); MIQ., Fl. Ind. Bat. III (1856?) 212; SCHOTT, Prodr. (1860) 310; ENGL. in DC., Mon. Phan. II (1879) 338 et Arac. Exsicc et Illustr. 63; HOOK. f., Fl. Brit. Ind. VI (1893) 533; RIDL., Mat. Fl. Mal. Pen. III (1907) 24; ENGL. in Pflanzenr. tom. cit. (1912) 64; RIDL., Fl. Malay Pen. V (1925) 104. *Syn. nov.*

H. coerulescens var. *pontederiifolia* (HOOK. f.) RIDL., Fl. Malay Pen. V (1925) 104. *Syn. nov.*

H. cordata sensu RIDL. in Kew Bull. (1926) 92.

H. curvata ENGL. in Pflanzenr. tom. cit. (1912) 53 fig. 29. *Syn. nov.*

H. gigantea ENGL. op. cit. (1912) 49 figs. 37 and 38. *Syn. nov.*

H. latifrons ENGL. op. cit. (1912) 54 fig. 30; v. ALD. v. ROS. op. cit. (1922) 182 p.p. *Syn. nov.*

H. major GRIFF., Notul. III (1851) 153; SCHOTT, Synops. (1856) 119, Prodr. (1860) 312. *Syn. nov.*

H. minor GRIFF. op. cit. (1851) 52; SCHOTT, Synops. (1856) 119, Prodr. (1860) 311. *Syn. nov.*

H. pontederiifolia GRIFF. ex HOOK. f., op. cit. (1893) 533; ENGL. in Pflanzenreich tom. cit. (1912) 55 fig. 31. *Syn. nov.*

H. Raapii ENGL. sensu RIDL. in Journ. Roy. Asiat. Soc. Mal. Branch I (1922) 104.

H. rosea v. ALD. v. ROS. in Bull. Jard. Bot. Buit. IV (1922) 334. *Syn. nov.*

H. singaporensis REGEL, Ind. Sem. Hort. Petrop. (1869) 19; Gartenfl. (1870) 53; HOOK. f., op. cit. (1893) 537; RIDL. in Journ. Bot. XL (1902) 34 pro. parte typica; RIDL., Mat. Fl. Mal. Pen. III (1907) 30 p.p.; ENGL. in Pflanzenreich tom. cit. (1912) 52 p.p.; RIDL., Flora cit. (1925) 110 p.p. *Syn. nov.*

H. Wallichii SCHOTT in Bonpl. VII (1859) 30, Prodr. (1860) 311. *Syn. nov.*

The original description of *H. rubra* as published in the Tijdschrift IX (1842) is as follows:

"cf. Cat. Horti Bogoriensis 305.3. RUMPH. amb. V. 223.—Petioli 1–1½ pedalis, supra medium cernui, folia 8–9 poll. juxta nervum medium longa, lobi 4 poll., latitudo 7–8 poll. Pedunculi primum erecti dein apice penduli, spatha extus rubra, intus viridis, 2–2½ poll."

In Cat. Hort. Bogor. II (1844) 57, the following information is recorded about this species under no. 305. 2:

"*H. Rubrum* HASSKL. (Dracunculus amboinicus ruber RMPH. amb. V. 323) *Tjarieang burrum* (rubrum)

"Caulescens humilius, foliis cordato-ovatis breviter acuminatis lobis baseos divaricatis subtus et petiolis, pedunculis, spatha ovariisque rubris, spatha spadice vix breviore mucronata."

HASSKARL listed another variety called *H. rubrum* var. *majus* (*Tjarieang burrum gedeh*), but did not describe it.

This species is very variable in the shape, size and colour of all its parts. Some plants are typical *rubra*, but others show all shades of absence of this colour so that purely green forms pass now as *H. alba* when they are from Java, or as *H. coerulescens*, when they are from the Malay Peninsula. Sometimes the spadices emerge from the spathes, and sometimes they are almost equal to, or shorter than, the spathes.

H. coerulescens was based originally on a plant collected by JUNGHUHN in Java*, but according to newer interpretations the name is restricted to specimens from the Malay Peninsula, though the peninsular form has older names given to it by GRIFFITH.

H. singaporensis is also a form of the same species. There is no reason why this should be identified with *H. Lindenii*, a plant introduced to Singapore many years after the description of REGEL. Young specimens of *H. rubra*, *H. rubescens*, *H. Lindenii* and allied species frequently produce small deltoid leaves when grown in pots, and probably this is a reason why the specimens of these species are frequently confused in herbaria. (cf. my remarks under *H. Lindenii*).

H. gigantea and *H. rosea* are larger forms of the same species. *H. bancana* and *H. pontederiifolia* are narrower leaved forms of this species, but transitions between these extremes and the typical *H. rubra* also occur. At most they could be separated as a variety of *H. rubra*. Others are merely various stages in the development of the plant.

SUMATRA: Mentawi Island (BODEN-KLOSS, 12297); Pulau Bangka (BÜNNEMEIJER, 1439, Holotype of *H. bancana*, HB; 2337 & 2422: Paratypes of *H. bancana*, HB); Brastagi (E. M. BURKILL, 110);

* Cf. Footnote under *H. sagittifolia* p. 227.

Tanjong Gedang (JACOBSON, 75, HB); Gunong Malintang (BÜNNEMEIJER, 3630, HB); Fort de Kock (JACOBSON, 2084, HB); Rambutan (BÜNNEMEIJER, 3390, HB); Gunong Koemitji (BÜNNEMEIJER, 8490 & 8660, HB); Sibolangit (NUR, 7410; LÖRZING, 5324, HB); Ophir Distr. (BÜNNEMEIJER, 604, HB); Gunong Sago (BÜNNEMEIJER, 4018, HB); Asahan (YATES, 1657, HB); Gajoe (DAALEN, 350, HB).

MALAYA: *Penang,* Government Hill (RIDLEY, VI–1898); Waterfall (CURTIS, 1857; RIDLEY, 9400); Moniots Road (BURKILL, 3304). *Kelantan:* Gua Musang (HENDERSON, 22706); Bukit Batu Papan (HENDERSON, 29518). *Pahang:* Sungei Tahan (RIDLEY, in 1891); Gunong Sennyum (HENDERSON, 22216); Fraser Hill, alt. 3900 ft. (NUR, 11380); Chegar Perah (HENDERSON, 19369). *Perak:* Grik (HENDERSON, 23871; BURKILL, 13835); Jor (HENDERSON, 10862); Tapah Road (BURKILL, 13435); Gopeng on Gunong Chantek (FURTADO, 33088); Kroh (FURTADO, 33036); Taiping Hill (HENDERSON, 10467); Maxwell Hill (BURKILL & HANIFF, 12792); Tanjong Malim (RIDLEY, II–1904); Pulau Lalang (SEIMUND); Gunong Tungal (RIDLEY, 7251). *Selangor:* Semangkok (RIDLEY, VIII–1904); Kampong Kerling (GOODENOUGH, 10–X–1899); Port Swettenham (BURKILL, 4097); Klang (BURKILL, 6839); Dusun Tua (RIDLEY, V–1896); Pahang Track (RIDLEY, 8489); Sungei Buloh (NUR, 11861). *Negri Sembilan:* Tampin Hill (BURKILL: 1344; 2520; 2527; 2546); Bukit Tangga (NUR, 11779); Gunong Beremban (ALVINS, 1683, vern. nom Keladi Moiang). *Malacca,* Bukit Sedanan (BURKILL, 1341); Nyalas (BURKILL, 539). *Johore,* Kluang (HOLTTUM, 9482). *Singapore:* Chan Chu Kang (RIDLEY, X–1889); Chua Chu Kang (RIDLEY, 29–VIII–1899); Pulau Buru (RIDLEY, V–1890); Seletar (RIDLEY, 6240); Bukit Mandai (RIDLEY, 6537); Kranji (GOODENOUGH, 14–VIII–1890); Bukit Timah (GOODENOUGH, 12–VIII–1889); Changi (RIDLEY, VII–1890).

RIAU ARCHIPELAGO: Pulau Papan (BÜNNEMEIJER, 7814, HB).

BORNEO: Loc. incert. (HALLIER: 68 & 1357, Syntypes of *H. latifrons,* HB); Tenompoh, on Mount Kinabalu, alt. 4500 ft. (leg. FURTADO, comm. CLEMENS, subn. 29 151).

JAVA: Preanger (WINCKEL, 854*B*, HB); Buitenzorg (HALLIER, 556*C*, HB; VAN STEENIS, 411, HB); Meester Cornelis (BACKER, II–1905, HB); Batavia (BACKER, 7142, HB).

CULT. IN HORT. BOT. BOGOR.: XI. B.X. 103 in HB: Syntype of *H. gigantea;* XI. B.X. 73: Holotype of *H. rosea,* HB; XI. B.X. 105, HB; XI. B.X. 98, Spermosyntype of *H latifrons,* HB).

39. **Homalomena Versteegii** ENGL. in Nova Guinea VIII (1911) 250 et in Pflanzenreich IV. 23. Da. [55] (1912) 52; KRAUSE et V. ALD. V. ROS. in Nova Guinea XIV (1927) 217.

H. Peekelii ENGL. var. *mamberamica* KRAUSE in Nova Guinea XIV (1927) 217 *Syn. nov.*

The specimens cited below are specifically identical, but KRAUSE and V. ALD. V. ROS. cited them under two different species. I have not seen the types of *H. Versteegii* and *H. Peekelii,* and so my identification of the specimens is based entirely on the descriptions.

NEW GUINEA: Prauwen Bivak, alt. 50–100 M. (LAM, 789, HB; 866, HB; 1223, HB—The last two are the syntypes of *H. Peekelii* var. *mamberamica*).

C. Section: CYRTOCLADON Furtado

40. **Homalomena Beccariana** Engl. in Bull. Soc. Tosc. Ort. (1879) 286, in Malesia I (1882) 281 et in Pflanzenreich IV. 23. Da [55] (1912) 66.

Borneo: Sarawak (non vidi).

41. **Homalomena borneensis** Ridl. in Journ. Roy. Asiat. Soc. Str. Br. XLIV (1905) 173; Engl. in Pflanzenreich IV. 23. Da. [55] (1912) 71.

Borneo: *Sarawak,* Kuching (Ridley, VII–1903, Holotype).

42. **Homalomena Gillii** Furtado **spec. nov.**

H. insigni affinis, sed differt lamina foliorum magis coriacea, spathis angustioribus; inflorescentia: mascula pro rata longiore; feminea minore.

Herba erectiuscula vel scandens. *Petiolus* longitudine multo variabilis, nunc quam lamina brevior, nunc longior, 5–15 cm. longus, ad medium vaginatus. *Lamina* foliorum plerumque coriacea, ambitu variabilis, oblonga, ovato- vel obovato-lanceolata, vel elliptica, interdum falcatoidea, basin versus acuta vel obtusa, 9-20 cm. longa, 2.5–6 cm. lata, nervis lateralibus primariis subprimariisque utrinsecus 6–9, alteris gracillimis. *Pedunculi* 4–8 cm. longi, graciles, petiolo breviores, raro eo æquilongi. *Spatha* ovata, apicem versus abrupte et valde attenuata, cuspidata, parte basilare 1–1.5 cm. longa, 8–12 mm. crassa, apicali circ. 3 cm. longa, 3–5 mm. crassa. *Spadix* spathæ subæquilongus, subsessilis; femineus 8–12 mm. longus, triplo brevior et duplo crassior apicali 3 cm. longo 3–4 mm. crasso, floribus oblonga stigmate orbiculari coronata. *Staminodia* et flores masculos non vidi.

Named after Walter Gill who collected extensively in the company of his uncle and aunt Mr. and Mrs. Joseph Clemens, and who showed very keen eyes in detecting small obscure plants in the jungle.

Borneo: *Mount Kinabalu:* Dallas, circa 3500 ft. alt. (Clemens, 29138, Holotype; 26226; 26730 and 29140); Tenompok, circa 4500 ft. (leg. Furtado & Kiah, comm. Clemens sub no. 29142; Clemens, 29145); Penibukan circa 5000 ft. (Clemens 31023). *Sandakan* at Bettotan (Boden Kloss, 19167).

The last mentioned (Boden Kloss 19167) has much shorter petioles, comparatively broader and longer sheaths than in the type, and the leaf base is obtuse. Otherwise it is indistinguishable from the other specimens.

43. **Homalomena Havilandii** RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIV (1905) 173; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 71.

The species is very near *H. Treubii* where the spathes are longer and the leaf-lamina larger and more rounded at base.

BORNEO: *Sarawak*, Bongritu (HAVILAND, 102, Holotype).

44. **Homalomena insignis** N. E. BR. in Illustr. Hort. XXXII (1885) 93 t. 560; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 68.

H. intermedia RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIV (1905) 175; ENGL. op. cit. (1912) 68; MERR., Enum. Bornean Pl. (1921) 94. *Syn. nov.* *H. sarawakensis* RIDL. op. cit. (1905) 172; ENGL. op. cit. (1912) 68; MERR., op. cit. (1921) 96. *Syn. nov.*

Originally described from plants introduced to European gardens from Borneo by the Campagnie Continentale d'Horticulture, *H. insignis* has not been associated with any subsequent collections from Borneo. I have not seen the type specimen, my identification of the species being based entirely on the original plate and description. The plants may either be green or produce various stages of redness in petiole, leaf and peduncle. This species is closely related to *H. schismatoglottoides* and *H. Nieuwenhuisii*, both of which however produce ovate, often cordulate leaves.

BORNEO: *Sarawak:* Matang (RIDLEY, 11714, Holotype of *H. sarawakensis;* RIDLEY, IX–1904); Bau (ANDERSON, 54).

45. **Homalomena kinabaluensis** Furtado **spec. nov.**

H. rostratae affinis, sed differt: herba minore; lamina foliorum breviore, chartacea, oblonga; petiolo breviore, multo graciliore; spatha chartacea. Facie foliorum *H. Gillii* simillima, sed spatha longiore, parte mascula paulo attenuata; spadice quam spatha multo breviore; inflorescentia feminea fere æquali dimensionibus masculæ facile diagnosci potest.

Herba erectiuscula vel scandens, circ. 30–40 cm. alta. *Lamina* foliorum oblonga, chartacea, interdum inæquilatera, basi acuta vel rotundato-acuta, apice acuta, mucronulata, 12–17 cm. longa, 5–7 cm. lata, nervis primariis utrinsecus 5–6 (primariis subprimariisque cunctis 7–9), alteris gracillimis, omnibus supra inconspicuis, subtus prominentibus. *Petiolus* 11–18 cm. longus, ad tertiam partem usque vaginatus. *Pedunculi* 7–14 cm. longi. Spatha 6–8 cm. longa, 5–10 mm. ampla, apicem versus sensim attenuata.

Spadix breviter stipitatus, brevior quam spatha, 3–6.5 cm. longus, 5–7 mm. crassus, inter masculam et femineam inflorescentiam zona florum asexualium præditus.

BORNEO: *Mount Kinabalu*, Tenompok, circ. 4500 ft. (leg. FURTADO comm. CLEMENS sub. no. 29137). Very common, but rarely in flower. The stem, petiole, peduncle, and spathe dark purple. Leaf lamina dark green above, paler beneath.

Here may also belong: CLEMENS 51019 collected at Gurulau Spur on Mount Kinabalu, but the specimen is poor.

46. **Homalomena lancea** Ridl. in Journ. Roy. Asiat. Soc. Straits Br. XLIV (1905) 176; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 66.

BORNEO: *Sarawak*, Matang (RIDLEY, VII–1903, Holotype).

47. **Homalomena lunduensis** Furtado in Gard. Bull. Straits Settl. VIII (1935) 148.

H. multinervia RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIX (1907) 49, non RIDL. (1902). *Basinym.*

BORNEO: *Sarawak*, Lundu (RIDLEY, Sept. 1905, Holotype). *Dutch West Borneo* (ENDERT, 3738, HB).

Here also appears to belong JAHERI 1142 (NIEUWENHUIS Exp.) from Sungei Parey in Borneo cited by ENGLER l.c. under *H. hostifolia* (= *H. ovata*).

48. **Homalomena Nieuwenhuisii** v. Ald. v. Ros. in Bull. Jard. Bot. Buitenz. IV (1922) 189.

This species is very near to *H. schismatoglottoidis;* but the spathes in *H. Nieuwenhuisii* are coriaceous and long-mucronate (circa 1 cm. mucro), and the neutral flowers are crowded, forming a uniform band between the male and female portions of the spadix. (In *H. schismatoglottoidis* the spathes are papery and not mucronate, and the neutral flowers are few and far apart). In leaf characters and habit the two species are hardly distinguishable, and judging from the herbarium specimens both appear to produce reddish colour in leaves, petioles and peduncles.

BORNEO: loc. incert. (leg. NIEUWENHUIS in 1882, floresc. in Hort. Bot. Bogor., Holotype, HB).

49. **Homalomena ovata** ENGL. in Bull. Soc. Tosc. Ort. (1879) 296 et in Malesia I (1883) 281.

H. hostifolia ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 70 fig. 45, pro parte typica. *Syn. nov.*

I have not seen the type of this species. JAHERI 1142 (NIEUWENHUIS Exp.) quoted by ENGLER under this may not belong here. Its spathes are much shorter than the ones described for *H. ovata.* In its mucronate spathes the proportions between the male and the female parts of the

spadix and in the size and shape of both the spathes and the leaves, JAHERI 1142 appears to be *H. lunduensis;* but the specimen is too poor to permit certainty in the determination

H. ovata is closely allied to *H. paludosa* but the leaves are shorter, more veined and vary in shape from elliptic to truncate ovate. On leaf characters alone the specimens of *H. ovata* are distinguished with difficulty from *H. lunduensis.*

H. ovata ENGL. (1879) has priority over *H. ovata* (SCHOTT) HOOK. f. (1893), and so *H. hostifolia* ENGL. (1912) is superfluous.

BORNEO: Mount Kinabalu at Dallas (leg. FURTADO, comm. CLEMENS sub no. 29134).

50. **Homalomena propinqua** SCHOTT in MIQ., Ann. Mus. Lugd. Bat. I (1863) 280; ENGL. in DC., Mon. Phan. II (1879) 334; RIDL. in Journ. Roy. Asiat. Soc. Straits Br. XLIV (1905) 172; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 72 p.p.; v. ALD. v. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 191 p.p.

H. Raapii ENGL. in Pflanzenreich tom. cit. (1912) 73 t. 49; v. ALD. v. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 191. *Syn. nov.*

H. sagittifolia JUNGH. ex SCHOTT sensu HOOK. f., Fl. Brit. Ind. VI (1893) 531; RIDL., Mat. Fl. Mal. Pen. III (1907) 23; ENGL. op. cit. (1912) 73; RIDL., Fl. Mal. Pen. V (1925) 103; omnino pro parte.

H. sagittifolia var. *sumatrana* v. ALD. v. ROS. op. cit. (1922) 192. *Syn. nov.*

As interpreted by the various authors mentioned above, *H. sagittifolia* agrees neither with the original description nor with any of the specimens from Java, whence SCHOTT appears to have received living specimens from JUNGHUHN: it (*H. sagittifolia* Auctt.) is conspecific with *H. propinqua.* The species is very variable as regards the shape of the leaves, some variations depending on the age of the plant. (see my remarks on *H. sagittifolia*).

It is possible that some of these variations deserve a varietal rank, but with the material at my disposal I am unable to distinguish the forms that are merely transient or ecologic from those that are really hereditary.

H. propinqua, though closely allied to *H. sagittifolia,* has not yet been recorded from Java.

MALAYA: *Perak:* loc. incert. (SCORTECHINI; WRAY, 1749); Larut Hills (CURTIS, 25–XII–1901); Tea Gardens (RIDLEY, in 1891); Maxwell Hill (WRAY); Taiping Hill (HENDERSON, 10256; BURKILL & HANIFF, 12805; RIDLEY, II–1904; in 1902); Tapah (FURTADO, 33098). *Pahang:* Pulau Tioman (NUR, 18573); Raub Track (MACHADO,

15–V–1903); Bentong by Sungei Kesar (FURTADO, 33116). *Negri Sembilan,* Bukit Tumiang (ALVINS, 1963). *Selangor,* Semangkok Pass (RIDLEY, in 1897); Semenyih (HUME, 7931); Ginting Bidai (RIDLEY, 7774). *Johore,* Pulau Tinggi (BURKILL, 908 & 931). *Singapore,* Bukit Timah (RIDLEY, in 1892; in 1906, HB).

SUMATRA: *Batoe Island* (RAAP, 235, Syntype of *H. Raapii,* HB); *Ophir:* Taloe (BÜNNEMEIJER, 129 & 159, HB); *Loeboeg Sikaping,* Bukit Kaboeng (BÜNNEMEIJER, 1220, HB).

ANAMBA ISLANDS: Siantan (VAN STEENIS, 707 & 917, HB; HENDERSON, 20262).

BORNEO: *Dutch Borneo,* loc. incert (AMDJAH, 261, HB; JAHERI, 1485, HB); Landak (TEYSMANN, 11542, HB) Gintang (KORTHALS, in Herb. Leiden: Syntype). *Sarawak,* Matang (RIDLEY, in VII–1903); Satubong (HEWITT, 17); Kapit (CLEMENS, 21926, HB); Bangey Island (CASTRO & MELEGRETO, 1410, HB). *Mount Kinabalu:* Penibukan alt. 5500 ft. (CLEMENS, 50279); Dallas alt. 2000–3000 ft. (leg. FURTADO comm. CLEMENS sub no. 29152; CLEMENS, 26732 & 26086).

51. **Homalomena punctulata** ENGL. in Bull. Soc. Tosc. Ort. (1879) 296 et in Malesia I (1883) 282; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 66.

H. crassinervia RIDL. in Journ. Roy. Asiat. Soc. Str. Br. XLIV (1905) 176.

BORNEO: *Sarawak* Matang (RIDLEY, VII–1903, Holotype of *H. crassinervia*); Mount Tiang Layu (HEWITT, 34).

52. **Homalomena rostrata** GRIFF., Notul. III (1851) 154 (errore typ. *H. roshalum*); SCHOTT, Synops. Aroid. (1856) 119, Prodr. (1860) 312; ENGL. in DC., Mon. Phan. II (1879) 343; ENGL. in Malesia I (1883) 281. sub *H. Bercarianae* observ. (ut *H. prostrata*); N. E. BR. in Illustr. XXXII (1885) 94 sub *H. insignis* observ. (ut *H. rostrata*); HOOK. f., Fl. Brit. Ind. VI (1893) 532; RIDL., Mat. Fl. Mal. Pen. III (1907) 24; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 66; RIDL., Fl. Mal. Pen. V (1925) 103.

H. ensiformis V. ALD. V. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 335. *Syn. nov.*

H. Miqueliana SCHOTT in MIQ., Ann. Mus. Lugd. Bat. I (1863) 120; ENGL. in DC., Mon. Phan. II (1879) 333 et in Pflanzenreich tom. cit. (1912) 69 fig. 44; V. ALD. V. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 190 et 335. *Syn. nov.*

H. Miqueliana var. *truella* V. ALD. V. ROS. in op. cit. (1922) 336. *Syn. nov.*

H. Teysmannii ENGL. op. cit. p. 68.

? *Cyrtocladon sanguinolentum* GRIFF., Notul. (1851) 147.

? *Chamaecladon sanguinolentum* (GRIFF.) SCHOTT Prodr. (1860) 316; ENGL. in DC., Mon. Phan. II (1879) 349.

This species is very variable in the shape of the leaves, the variations depending mostly on age and to a certain extent also on environment. Some leaves are very narrow with cuneate base (*H. Teysmannii* form), others are much broader with the broadest portion above the middle, and still others have the broadest portion below the middle and near the base. The last mentioned form tends to produce leaves with rounded base (*H. Miqueliana* form).

I have not seen any authentic specimens of *H. Beccariana* and from the key given by ENGLER in Pflanzenreich (p. 29) it appears that this species differs very much from *H. rostrata;* but in *Malesia I* (p. 281), ENGLER recorded that *H. Beccariana* is very near to *H. rostrata* and that it may be identical with it.

I have not seen the type of *Cyrtocladon sanguinolentum;* but from the general description it appears that HOOKER was right in reducing it here. But GRIFFITH described the spathes as shedding their apical portions, a character noticed in *Schismatoglottis* and *Piptospatha.* The type must be examined in order to verify whether it is really a *Homalomena* species. In the type specimens the spathes might have been injured.

MALAYA: *Pahang:* Kuala Maliang (RIDLEY, 26–VI–1891); Semantan in swampy forest (BURN-MURDOCH, 155); Kota Glanggi (HENDERSON, 22504); Temerloh (HENDERSON, 10527). *Selangor,* Kuala Langat (BURKILL, 4101); Bukit Changgang near Kuala Langat (NUR, 33992); Kuala Lumpur (RIDLEY, 27–VII–1889); Telok Reserve in Klang (BURKILL, 6521); Batang Berjuntai (RIDLEY, 7662). *Negri Sembilan,* Tampin (NUR, 1317). *Malacca,* Batang Malacca (BURKILL, 3192; 3193; 3194; & 3195); Bukit Bruang (CURTIS, V–1901; RIDLEY, 3529); Brisu (HOLMBERG, 743). *Johore,* Sungei Sedili Ketchil (CORNER, 28612).

RIAU ARCHIPELAGO: Pulau Bintan (BÜNNEMEIJER, 6200, HB; Holotype of *H. miqueliana* var. *truella*).

BORNEO: Pontiak (MONDI, 14, HB); Lundu (FOXWORTHY, 58); loc. incert. (HALLIER, 1465, HB, Holotype of *H. ensiformis*).

SUMATRA: Banka Island at Plangas (TEYSMANN, 3227, HB, Holotype of *H. Teysmannii*).

53. **Homalomena sagittifolia** Jungh. ex Schott, Synops. Aroid. I (1856) 119, et MIQ., Fl. Bat. Ind. III (1856?) 212 nomen nudum; SCHOTT in Prodr. (1860) 311; ENGL. in DC., Mon. Phan. II (1879) 334; HOOK. f., Fl. Brit. Ind. VI (1893) 531 p.p.; RIDL., Mat. Fl. Mal. Pen. III (1907) 23 p.p.; ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 73 p.p.; RIDL., Fl. Malay Pen. V (1925) 103 p.p.

H. paludosa HOOK. f., op. cit. (1893) 531; RIDL., Mat. cit. (1907) 24; ENGL. in Pflanzenr. tom. cit. (1912) 73; RIDL., Fl. cit. (1925) 104. *Syn. nov.*

H. propinqua SCHOTT sensu ENGL. in Pflanzenr. tom. cit. (1912) 72; v. ALD. v. ROS. in Bull. Jard. Buitenz. IV (1922) 191 p.p.

H. Ridleyana ENGL. in Bot. Jahrb. XXXVII (1905) 123. *Syn. nov.*

When the name *H. sagittifolia* first appeared in print*, it was a nomen nudum, and was accompanied by the following information:

"*H. sagittifolia* JUNGHUHN (in schedula)—(Stirps viva nondum satis evoluta notas differentiales non offert)—Java."

This information was reprinted verbatim by MIQUEL. Four years later (in 1860), when the name was duly validated, SCHOTT, the author of the description, cited a Bornean specimen collected by MOTLEY (preserved in HOOKER'S herbarium) and added that he had seen the plant also alive.

From this I conclude: (1) that JUNGHUHN, who had botanised in Java, supplied to SCHOTT a living specimen under the above-mentioned binomial for the purpose of cultivating it in Schœnbrunn garden where SCHOTT, its director, was studying the Aroids; and (2) that the Javanese plant must be included as a syntype, if not as a holotype.

It is not improbable that MOTLEY'S specimen was the same as the one which SCHOTT later cited under *H. propinqua*. ENGLER (op. cit. 1879 and 1912), who had

* From an unpublished Catalogue of the plants growing in the Buitenzorg Gardens (which was printed in Java in 1855), it appears that both *Homalomena coerulescens* and *H. sagittifolia* were so named originally by TEYSMANN and BINNENDIJK, the then curators of the Gardens and the joint authors of the unpublished Catalogue. JUNGHUHN must have obtained tubers of these species from Buitenzorg Gardens and sent them to SCHOTT under the above mentioned botanical names but without any indication as to their real authorship—an obvious reason why SCHOTT attributed the paternity of the names to JUNGHUHN. The following entries in the Catalogue support this conclusion of mine:

p. 50: "*Homalomena coerulescens* T. et B. (20)....Tjariang boelauw."

"*Homalomena sagittifolium* T. et B. (21)....Tjariang heedjoh."

The numbers in brackets refer to the original descriptions given on page 240 of the Catalogue, which run thus:

(20) "*Homalomena coerulescens*":

"Hom. caulescens; foliis cordato-ovatis, breviter acuminatis, lobis baseos rotundatis supra coerulescentibus subtus pedunculis spathisque atroviridis, spatha spadice vix breviore."

"Habit. In humidis montosis provinciæ Buitenzorg."

(21) *Homalomena sagittifolium*:

"Hom. subcaulescens; foliis oblongo-cordato-ovatis breviter acuminatis, lobis baseos divaricatis subsinuatis, petiolis atroviride—striatis; pedunculis brevibus, spatha alba mucronata."

"Habit. In humidis montosis provinciæ Buitenzorg."

examined HOOKER'S herbarium at Kew, cited MOTLEY'S specimen under *H. propinqua* and not under *H. sagittifolia*. HOOKER (1893), who had not seen KORTHAL'S specimen cited under *H. propinqua*, doubtfully reduced this last binomial as a synonym of *H. sagittifolia*. RIDLEY (Journ. Roy. Asiat. Soc. Str. Br. XLIV, 1905 p. 172) also speaks as if there was only one specimen of MOTLEY'S; he quotes it under *H. sagittifolia* together with KORTHAL'S, but remarks that ENGLER had quoted them under *H. propinqua*.

In interpreting *H. sagittifolia*, however, ENGLER (1879) did not consider MOTLEY'S specimen, but cited a Javanese specimen from Leiden Herbarium which, I am informed, was so determined by SCHOTT himself.

From the comparisons with this material made at my request by Dr. S. J. VAN OOSTSTROOM of Leiden, I conclude that this species (*H. sagittifolia*) is the one that passes as *H. propinqua* if it is from Java and Borneo, and as *H. paludosa* if it is from the Malay Peninsula. This interpretation also accords with the original description of *H. sagittifolia* which was said to have "elongato-hastata" leaves, whereas *H. sagittifolia* as currently intepreted not only does not agree with SCHOTT'S original description of the species, but also has not been recorded from Java.

H. propinqua as interpreted by ENGLER (*e.g.* HALLIER 1356) is a much smaller form. *H. Ridleyana* has leaves that are more elongate, less triangular in shape, and less cordate at base. KUNSTLER 3082 from the Singapore herbarium (a haptosyntype of *H. paludosa*) differs but very little from HALLIER 1356, but most of the specimens from the Malay Peninsula are larger like the Javanese. The species is very near *H. rostrata*.

The specimens vary a great deal in the shape and size of the leaves.

JAVA: Hort. Bot. Bogor. cult. (XI. B.X. 167, HB); Buitenzorg (KOORDERS, 30812*B* partim, HB; BAKHUIZEN V/D BRINK: 7063, HB; 5016, HB).

MALAYA: *Perak*, Larut (KUNSTLER, 3082, Haptosyntype of *H. paludosa*). *Province Wellesley*, Tasek Glugor (BURKILL, 6400 bis). *Singapore*, Seletar (RIDLEY, 23–IV–1889); Changi (RIDLEY, 4607); Ang Mo Kio (RIDLEY, in 1894); Bukit Panjang (RIDLEY, in 1905); Bukit Timah (RIDLEY, 6318 & 6538); Bukit Mandai (RIDLEY, in 1894 & 1899). *Johore*, Pulau Kukub (RIDLEY, in 1909); Tanjong Kopang (RIDLEY, 6310).

BORNEO: loc. incert. (HALLIER: 1356, HB; 1391, HB); W. Koetai (ENDERT, 1922, HB); Kalaka (HAVILAND, 11–IV–1893); Kuching (HAVILAND, 3134; 19–V–1893, Holotype of *H. Ridleyana*); Lundu (FOXWORTHY, 41).

54. Homalomena sagittifolia var. **angustifolia** FURTADO **var. nov.**

A forma typica differt lamina foliorum angustiore et longiore.

Many of the specimens cited here were quoted by RIDLEY (1907 & 1925) and ENGLER (1912) under *H. paludosa*. ENGLER'S fig. 50 represents this form. This variety makes one suspect that *H. sagittifolia* may be a variety of *H. rostrata*. The two species require a further study in their range of variations.

MALAYA: *Singapore:* Sungei Jurong (RIDLEY, in 1897); Krangi (RIDLEY, in 1889); Toas (RIDLEY, in 1894). *Johore:* Castlewood (RIDLEY, in 1905); Tanjong Kopang (RIDLEY, in 1892); Sungei Berassau (CORNER, 29360); Mount Austen (RIDLEY, 12018).

SUMATRA: Langat (BEUMÉE, A–486, HB).

55. **Homalomena schismatoglottoides** ENGL. in Pflanzenreich IV. 23. Da [55] (1912) 71.

BORNEO: Soengei Maruee (AMDJAH, 226, HB, Holotype).

56. **Homalomena subcordata** ENGL. in Bot. Jahrb. I (1882) 183, in Malesia I (1883) 281 [non *H. subcordata* (SCHOTT) ENGL. (1912) = *H. Korthalsii*].

H. subcordifolia ENGL. in Pflanzenreich IV. 23. Da [55] (1912) 71. *Syn. nov.*

H. subcordata ENGL. (1882) has priority over *H. subcordata* (SCHOTT) ENGL. (1912), and hence *H. subcordifolia* is superfluous.

BORNEO: *Sarawak* (non vidi).

57. **Homalomena subemarginata** v. Ald. v. Ros. in Bull. Jard. Bot. Buitenz. IV (1922) 190.

This species is known entirely from specimens cultivated in the Botanical Gardens, Buitenzorg. On a specimen from group XI. B. X. 66 the nativity of this species is indicated to be Java; but this must be an error, for the species is very closely allied to *H. borneensis*, if not identical with it, and has no allies in Java. Probably it was introduced from Borneo.

HORT. BOT. BOGOR. CULT.: XI. B.X. 46, Holotype in HB; XI. B.X. 66.

58. **Homalomena Treubii** ENGL. in Pflanzenreich IV. 23. Da. [55] (1912) 70; v. ALD. v. ROS. in Bull. Jard. Bot. Buitenz. IV (1922) 188.

This species is very like *H. Havilandii* from which it differs by larger leaves and spathes and more rounded base of the leaves.

BORNEO: (HALLIER, 2622, Holotype, HB).

V. Summary of the Systematic Notes

In order to facilitate the classification of the Indo-Malaysian species I have created a new section CYRTOCLADON to include all those *Homalomena* species which have their

spathes constricted above the female inflorescence. This section appears to be much more natural and distinct than the section *Chamaecladon.*

Apart from the many forms or varieties described as new or reduced as synonyms, the following is a summary of the systematic notes on the species:

A. NEW SPECIES: (*a*) Malaya (*i.e.* Malay Peninsula): *H. confusa, H. Corneri, H. Hendersonii, H. Kiahii* and *H. montana;*
(*b*) Sumatra: *H. ellipticifolia* and *H. mentawiensis;*
(*c*) Borneo: *H. Gillii* and *H. kinabaluensis;* and
(*d*) New Guinea: *H. Carrii.*

B. NEW COMBINATIONS: *H. Korthalsii.*

C. NEW INTERPRETATIONS: *H. alba, H. angustifolia, H. cordata, H. humilis, H. propinqua, H. purpurascens, H. pygmaea, H. rubra, H. sagittifolia* and *H. singaporensis.*

D. NEW REDUCTIONS: *Chamaecladon rubescens, H. alba* (see footnote p. 213), *H. bancana, H. Burkilliana H. coerulescens, H. coccinea, H. crassa, H. discolor, H. ensiformis, H. falcata, H. gigantea, H. hostiifolia, H. intermedia, H. javanica, H. johorensis, H. latifrons, H. lucidula, H. metallica, H. Miquelliana, H. multinervia, H. multivenosa, H. obliquata, H. ovata* (SCHOTT) HOOK. f., *H. palliformis, H. paludosa, H. pumila, H. pygmaea, H. Raapii, H. repens, H. rosea, H. rubrovaginata, H. sarawakensis, H. singaporensis, H. subcordata* (SCHOTT) ENGL., *H. subcordifolia* and *H. velutina.*

E. OLD NAMES RESTORED: *H. Gaudichaudii, H. Lindenii, H. ovata* ENGL., and *H. subcordata* ENGL.

VI. Index to the Numbers Cited

ACHMAD:
1723(*12*).
ALVINS:
1683 (*38*); 1849(*1*); 1963(*50*); 2239(*13-c*).
AMDJAH:
226(*55*); 261(*50*).
ANDERSON:
54(*44*); 85(*20*).
BACKER:
710(*17*); 1633(*17*); 4608(*17*); 5907(*18*); 7114(*18*); 7142(*38*); 10271(*18*); 11275(*36*); 18750(*36*); 23365(*17*); 27017(*36*); 27477(*36*); 29723(*36*); 31130(*18*).

BAKHUIZEN v/d BRINK:
11(*17*); 172= 3222(*18*); 789(*17*); 3100(*17*); 3222= 172(*18*); 3615(*17*); 3616(*17*); 3995(*17*); 5016(*53*); 5028(*18*); 5029(*17*); 5030(*18*); 6390(*18*); 7063(*53*); 7065(*18*); 7185(*18*).

BEST:
7723(*19*).

BEUMÉE:
A-337(*17*); A-486(*54*); 816(*36*); 3897(*36*); 5045(*36*); 5560(*36*).

BODEN KLOSS:
11441(*3*); 12297(*38*); 14777(*25*); 19167(*42*).

BROOKS:
A-4(*20*).

BÜNNEMEIJER:
129(*50*); 159(*50*); 584(*21*); 604(*38*); 1220(*50*); 1439(*38*); 2387(*38*); 2422(*38*); 3104(*3*); 3239(*14*); 3254(*14*); 3390(*38*); 3630(*38*); 4018(*38*); 5811(*6*); 6200(*52*); 7814(*38*); 8490(*38*); 8660(*38*).

BURKILL (E.M.):
110(*38*).

BURKILL:
539(*38*); 711(*13-b*); 724(*13-d*); 908(*50*); 918(*20*); 931(*50*); 1341(*38*); 1344(*38*); 2520(*38*); 2527(*38*); 2544(*35*); 2546(*38*); 2559(*20*); 2820(*10*); 3192(*52*); 3193(*52*); 3194(*52*); 3195(*52*); 3304(*38*); 4080(*13-a*); 4097(*38*); 4101(*52*); 4552(*5*); 6304(*20*); 6400 bis(*53*); 6521(*52*); 6602(*13-e*); 6839(*38*); 9965(*13-c*); 13435(*38*); 13835(*38*).

BURKILL & HANIFF:
12792(*38*); 12805(*50*); 16937(*13-c*); 16951(*30*); 16974(*24*).

BURKILL & HOLTTUM:
7879(*19*); 9016(*13-b*).

BURN-MURDOCH:
155(*52*).

CARR:
12053(*4*); 12603(*37*).

CASTRO & MELEGRITO:
1410(*50*).

CLEMENS:
21926(*50*); 26086(*50*); 26199(*20*); 26226(*42*); 26730(*42*); 26732(*50*); 27230(*20*); 29134(*49*); 29137(45); 29138(*42*); 29139(*20*); 29140(*42*); 29142(*42*); 29145(*42*); 29151(*38*); 29152(*50*); 31023(*42*); 32508(*20*); 50279(*50*); 51019(*45*).

CORNER:
28612(*52*); 29360(*54*); 30436(*9*); 30691(*20*); 31687(*10*); 33578(*13-d*); 33579(*22-b*); 33581(*7*); 33685(*35*); 33687(*10*); 33692(*5*).

CURTIS:
1857(*38*); 2886(*5*).

DAALEN:
30(*21*); 350(*38*).

DE VRIES:
43(*17*).

DOCTERS VAN LEEUWEN:
Hort. Bot. Bogor. cult. XI. B.X. 50(*31*).

ENDERT:
1922(*53*); 2630(*20*); 3738(*47*).

FOXWORTHY:
41(*53*); 58(*52*).

FURTADO:
33036(*38*); 33082(*10*); 33088(*38*); 33098(*50*); 33106(*24*); 33116(*50*); 33127(*1*); 33129(*2*).

GALOENGI:
172(*31*).

GOODENOUGH:
1661(*13-a*).

HALLIER:
68(*38*); 556c(*38*); 648(*36*); 1356(*53*); 1357(*38*); 1391(*53*); 1465(*52*); 2622(*58*).

HANIFF & NUR:
7969(*5*); 10362(*13-a*).

HAVILAND:
102(*43*); 3134(*53*).

HENDERSON:
10185(*9*); 10256(*50*); 10318(*10*); 10467(*38*); 10527(*52*); 10862(*38*); 17758(*20*); 18374(*20*); 19369(*38*); 19372(*13-a*); 20105(*32*); 20262(*50*); 20389(*32*); 21354(*16-a*); 22000(*13-a*); 22216(*38*); 22504(*52*); 22600(*13-a*); 22659(*29*); 22706(*38*); 23871(*38*); 23872(*10*); 29518(*38*); 29564(*24*); 29663(*15*).

HEWITT:
17(*50*); 34(*51*).

HOLMBERG:
173(*52*).

HOLTUM:
9391(*20*); 9420(*13-a*); 9482(*38*); 9736(*1*); 10863 partim (*32*); 19933(*32*).

HUME:
7099(*16-a*); 7598(*16-a*); 7931(*50*); 8975(*24*); 9457(*13-a*); 9549(*16-a*).
IBOET:
30(*3*); 512(*25*).
JACOBSON:
75(*38*); 2084(*38*).
JAHERI:
215(*20*); 1142(*47*); 1485(*50*).
KARTA:
92(*36*).
KIAH:
32056(*13-b*); 32146(*22-b*); 32358(*22*).
KING'S Collector in Malay Peninsula *vide* KUNSTLER
KJELLBERG:
612(*21*).
KOORDERS:
16180β(*21*); 30182β(*53*); 39695β(*17*); 41322β(*17*); 41580β(*18*).
KORTHALS:
221(*28*).
KRAMER:
118(*36*).
KUNSTLER:
3082(*53*); 10603(*35*).
LAM:
722(*29*); 789(*39*); 866 & 1223(*39*).
LATIF:
8(*20*).
LÖRZING:
1716(*36*); 5324(*38*); 5361(*3*); 5728(*3*).
LÖRZING & JOCHEMS:
7380(*31*).
MAT:
3722(*20*).
MONDI:
14(*52*).
MOYSEY & KIAH:
31839(*27*).
NUR:
1317(*52*); 7367(*31*); 7410(*38*); 7412(*34*); 11037(*16-a*); 11380(*38*); 11595(*9*); 11605(*20*); 11779(*38*); 11861(*38*); 18573(*50*); 33992(*52*).
PULLE:
398 & 410(*33*).

RAAP:
186(*3*); 235(*50*); 266(*3*); 412(*16-a*).
REINWARDT:
19-a(17).
RIDLEY:
2391(*5*); 2952(*16-a*); 3529(*52*); 4607(*53*); 5123(*5*); 6240(*38*); 6310(*53*); 6318(*53*); 6537(*38*); 6538(*53*); 7033(*16-a*); 7251(*38*); 7662(*52*); 7665(*16-a*); 7774(*50*); 8462(*24*); 8488(*5*); 8489(*38*); 9400 (*38*); 9793(*5*); 10177(*16-a*); 10223(*13-d*); 10327(*16-a*); 11193(*20*); 11421 (*20*); 11713(*13-f*); 11714(*44*); 11932(*20*); 11990(*20*); 12018(*54*); 12144(*20*), 12417(*10*); 13237(*35*); 13239(*13-a*); 13398(*16-a*); 13399 (*16-a*); 13469(*21*); 13842 & 13842a (*21*); 14031(*16-a*); 14304(*21*); 14305(*5*); 14306(*10*); 14367(*30*); 15491(*5*); 16188(*5*).
ROBINSON & KLOSS:
6123(*20*).
ROMER:
451(*29*).
SAPII:
117(*36*); 2000(*36*).
SCORTECHINI:
256 & 256a(*10*); 276b in Herb. Singapore (*16-a*); 276b in Herb. Bogor. (*20*); 606a(*10*).
SEIMUND:
60(*13-d*).
SLOOTEN:
245(*36*); 597(*17*).
STEENIS:
411(*38*); 687(*32*); 707(*50*); 917(*50*); 1191(*6*); 1445(*16-a*); 2439(*17*); 3794(*20*).
TEYSMANN:
3227(*52*); 10826(*21*); 11542(*50*); 12421(*21*).
VAN DER PIJL:
70(*18*).
VAN SLOOTEN vide SLOOTEN.
VAN STEENIS vide STEENIS.
VOOGD:
321(*32*).
WINCKEL:
854B(*38*).
WRAY:
385(*24*); 1034(*16-a*); 1749(*50*); 1976(*10*).
YATES:
1657(*38*).

VII. Index to the Botanical Names

New botanical names in **clarendon** type
Synonyms in *italics*

Aglaonema:
pygmaeum (18 & 18 observ.) 201 & 202
pygmaeum var. *majus* (17 & 18 observ.) 200, 202
var. *purpurascens* (18) 201
Alocasia Lindenii (37) 216
Anappur:
alba (36) 215
nigra (36) 214 & 215
rubra (36) 215
Calla:
angustifolia (20) 203 & 205
humilis (16-a & 20) 199 & 205
Chamæcladon:
angustifolium (5 & 20) 189 & 204
consobrinum (6) 190
Griffithii (13) 194
Griffithii var. *argenteum* (1) 186
humile (16-a) 199
lanceolatum (17) 200
lanceolatum var. *purpurascens* (18) 201
metallicum (13) 194
nigrescens (28) 210
obliquatum (13) 194
ovatum (13) 194
purpurascens (18) 201
pygmaeum (17 & 18) 200 & 201
pygmaeum var. *latifolium* (20) 204
rubescens (18) 201
sanguinolentum (52) 225
subcordatum (23) 208
Cyrtocladon sanguinolentum (52) 225
Dracunculus:
amboinicus (36) 214
amboinicus ruber (38) 219
cordatum (36 footnote) 213
Homalomena:
alba (36 and footnote) 213
angustifolia (5 & 20) 189 & 204
angustifolia var. *ophirensis* (19) 203
angustifolia var. *parvula* (5) 189
argentea (1) 186
argentea var. **purpurascens** (2) 188
aromatica var. *cordata* (38) 218
bancana (38) 218

batoensis (3 & 24) 188 & 208
Beccariana (40) 221
borneensis (41) 221
Burkilliana (34) 213
Carrii (4) 189
coccinea (18) 201
coerulescens (38) 218 & 227 footnote
coerulescens var. *pontederiifolia* (38) 218
confusa (5) 189
consobrina (6) 190
cordata (36 footnote) 213
Corneri (7) 191
crassa (35) 213
crassinervia (51) 225
Curtisii (8 & 19) 191, 203
curvata (38) 218
deltoidea (9) 192
discolor (36) 214
elliptica (10) 192
elliptica var. **paucinervia** (11) 193
ellipticifolia (12) 193
ensiformis (52) 225
falcata (13 & 13-e) 194 & 197
Gaudichaudii (36 footnote) 213
gigantea (38) 218
Gillii (42) 221
Griffithii (13-a) 195
„ forma **acuminata** (13-f) 197
„ var. falcata (10) 192
„ forma **falcatoidea** (13-e) 197
„ „ **Kingii** (13-b) 196
„ „ **obliquata** (13-d) 196
„ var. *obliquata* (13-d) 196
„ „ *ovata* (13) 195
„ forma **sigmoidea** (13-c) 196
„ „ var. **sumatrana** (14) 198
Havilandii (43) 222
Hendersonii (15) 198
hostiifolia (49) 223
humilis (16 & 16-a) 199
„ var. **major** (17) 200
„ var. **major** subvar. **coccinea** (18) 201
„ var. **ophirensis** (8 & 19) 192 & 203
„ var. **pumila** (20) 203
„ var. undulata (21) 207
„ var. velutina (16-a) 199
insignis (44) 222
intermedia (44) 222
javanica (36) 214

javanica var. *kangeanensis* (36) 214
johorensis (20) 204
Kiahii (22) 207
„ forma **maculata** (22-b) 208
kinabaluensis (45) 222
Kingii (13 & 13-b) 194 & 196
Korthalsii (23) 208
lancea (46) 223
lancifolia (24) 208
latifrons (38) 218
Lindenii (37) 216
lucidula (32) 212
lunduensis (47) 223
major (38) 218
mentawiensis (25) 209
metallica (13) 194
minor (38) 218
Miqueliana (52) 225
mixta (26) 209
montana (27) 210
multinervia (11 & 47) 193 & 223
multivenosa (3) 188
Nieuwenhuisii (48) 223
nigrescens (28) 210
novo-guineensis (29) 211
nutans (30) 211
oblanceolata (31) 212
obliquata (13 & 13-d) 194 & 196
obscurifolia (2) 188
ovata (13) 195
ovata (49) 223
palliformis (36) 214
paludosa (53) 226
paucinervia (32) 212
Peekelii var. *mamberamica* (39) 220
pontederiifolia (38) 218
propinqua (50) 224
Pulleana (33) 212
pumila (20) 204
pumila var. *purpurascens* (18) 202
punctulata (51) 225
purpurascens (18 & 20) 202 & 204
purpurascens var. *pumila* (20) 204
pygmaea (16-a, 17 & 18) 199, 200 & 202
„ var. *latifolia* (20) 204
„ forma *longipes* (12) 193
„ var. *pumila* (20) 204
„ „ *purpurascens* (18) 202

Raapii (50) 224
refulgens (34) 213
repens (21) 207
Ridleyana (53) 227
rostrata (52) 225
rubra (38) 217
rubrovaginata (18) 202
„ var. *subpurpurea* (18) 202
sagittifolia (50) 224
sagittifolia (53) 226
„ var. **angustifolia** (54) 228
„ var. *sumatrana* (50) 224
sarawakensis (44) 222
schismatoglottoides (55) 229
Scortechinii (35) 213
singaporensis (38) 218
subcordata (56) 229
subcordata (23) 208
subcordifolia (56) 229
subemarginata (57) 229
Teysmannii (52) 225
trapezifolia (10) 192
Treubii (58) 229
undulatifolia (21) 207
velutina (16-a) 199
Versteegii (39) 220
Wallichii (38) 218
Zollingeri (36) 214
Piptospatha Ridleyi var. *lanceolata* (32) 212.

NOTES ON THE SYSTEMATY AND DISTRIBUTION OF MALAYAN PHANEROGAMS III

By E. J. H. CORNER,

Botanical Gardens, Singapore

Note.—The contractions C.F. (Conservator of Forests) and SFN (Singapore Field Number) are used to indicate the collections made by the Forest Department, S.S. & F.M.S. and the Botanic Gardens, Singapore respectively. Both of these Departments use a single series of field numbers which serve also as Herbarium numbers.

DACRYDIUM

There is much yet to be learnt, both systematic and ecological, about the needle-leafed, Malayan members of this genus and the systematic, as well as the ecological, study must be made in the field. We have been credited with two such species, *D. elatum* and *D. Beccarii,* but my own observations have led me to distinguish a third species, *D. comosum,* and a marked variety of *D. Beccarii,* namely var. *subelatum.* The differences between the species rest almost entirely on the size of the leaf and this may alter greatly as the tree grows from the sapling to the adult. A sterile herbarium specimen unaccompanied by field-notes describing the size of the tree, the position of the branch from which the specimen was taken, the variation in leaf-size over the whole crown of the tree and the habitat of the tree, may therefore be classified in the herbarium as either the juvenile stage of one species or the adult of another. The specimens in the Singapore Herbarium, as well as those cited in Ridley's Flora are much confused and no one, it seems, has published a critical study of the living trees or even pointed out that it is impossible to identify them at present. After examining, purposely, many wild trees on Penang Hill, Fraser's Hill (Pahang), Gunong Tahan (Pahang) and those cultivated in Penang, Kuala Lumpur and Singapore, I propose the following classification.

It should be noted that I can find no specific differences in the shape, size or colour of the ovule or the seed or in the size of the male-cone. But the position and grouping of the ovules (singly or paired) may be characteristic, though I have not seen sufficient fertile trees to satisfy myself on this point, and those trees with longer needle-leaves have shortly acuminate scales to the male-cones. The apparently specific characters of the male-cone are merely the reflection of the vegetative differences.

KEY TO THE NEEDLE-LEAFED SPECIES OF DACRYDIUM IN MALAYA

Twigs very dimorphous: lower branches of young trees with drooping bushy twigs set with needle-leaves 6–12 mm. long: upper or fertile twigs erect, cord-like, 1–2 mm. wide, with minute adpressed scale-leaves 1–1.5 mm. long, without projecting leaf-points	*D. elatum*
Twigs not or only slightly dimorphous: upper twigs always with projecting leaf-points	
Upper or fertile twigs with needle-leaves 12–20 × .7–1.3 mm., very bushy: lower or sapling twigs with needles 20–33 mm. long	*D. comosum*
Upper or fertile twigs with needles 3–12 mm. long, often distinctly narrower than the lower bushy longer-needled twigs: needles of saplings and lower twigs 8–20 mm. long	*D. Beccarii*
Upper or fertile twigs with needle-leaves 3–5 (–7) mm. long, distinctly narrower than the lower, bushy, long-needled twigs of young trees	var. *subelatum*
Upper or fertile twigs with needle-leaves 6–12 (–16) mm. long, little less bushy than the lower twigs of young trees	
Needle-leaves on the upper twigs .4–.8 mm. wide ..... typical	*D. Beccarii*
Needle-leaves on the upper twigs .7–1.3 mm. wide, coarse: Mt. Kinabalu	var. *kinabaluense*

KEY TO THE SAPLINGS

Needle-leaves 6–12 mm. long	*D. elatum*
Needle-leaves 10–20 mm. long	*D. Beccarii*
Needle-leaves 20–33 mm. long	*D. comosum*

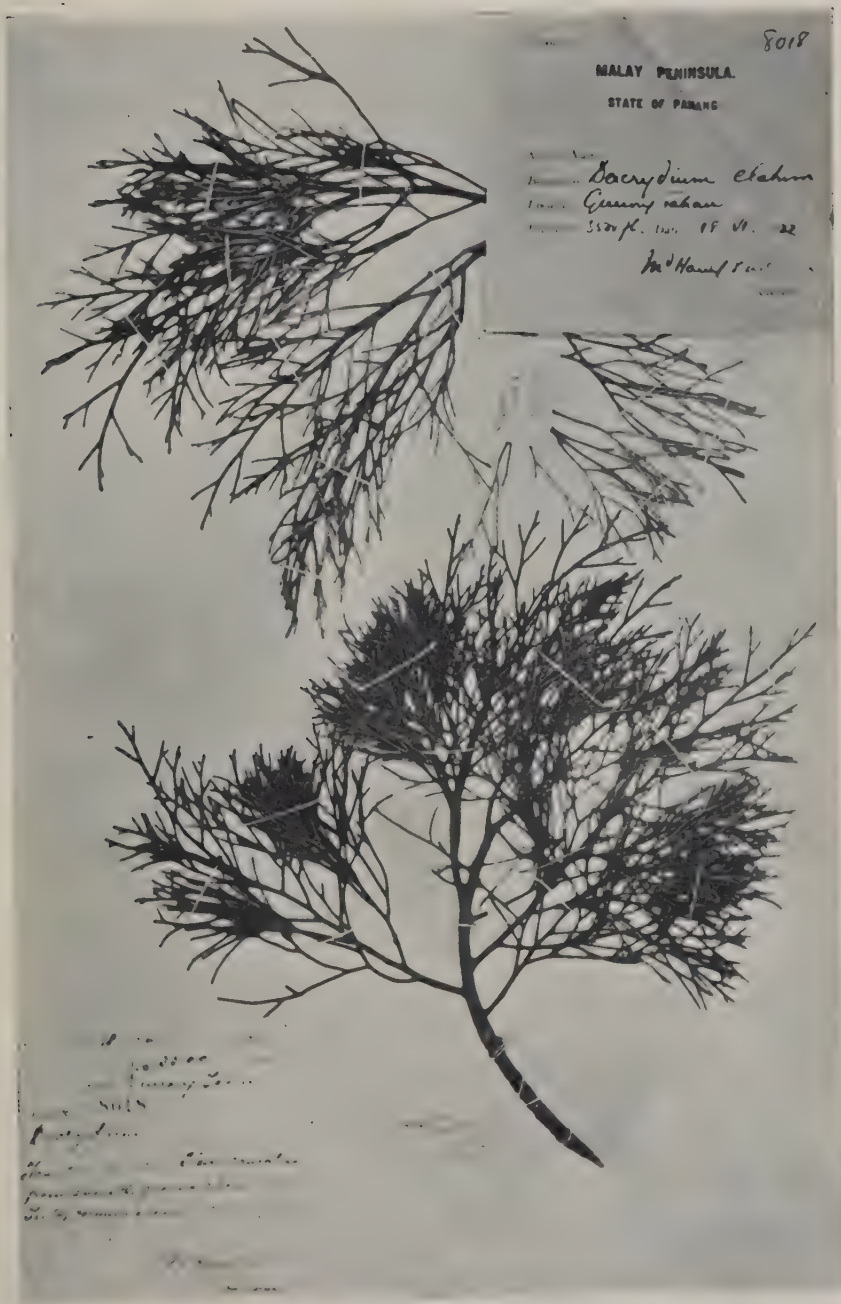
D. elatum (Roxb.) Wall. ex Hooker, Lond. Journ. Bot. II, *1843*, p. 144, t. 2. **Plate 5.**

Wallich Cat. No. 6045 (*1832*).

Syn. *Juniperus elata* Roxb. Fl. Ind. III, *1832*, p. 838.

This, the commonest and best known Malayan species, has the most remarkably dimorphous twigs. Both kinds of twig may generally be found on unpruned, cultivated trees in the open but in the forest the bushy sapling twigs are lost when the tree is 15–20 feet high; the crowns of the adult forest-trees being composed entirely of posses of erect, cord-like and apparently leafless twigs. The seeds are solitary and, generally, terminal on the cord-twigs, occasionally lateral, and the cup is slightly reticulate at the base, though for the most part smooth. The male cones are terminal and have blunt scales. So far as I have seen, the sapling form of twig is never fertile.

D. elatum is, typically, a tall, conical or dome-like tree of mid-mountain forest (500–1,700 m.). In Penang, however, it grows in the forest almost at sea-level and throughout Malaya it is readily cultivated on open lawns in the plains, where it produces fertile seed. In the



Dacrydium elatum mature cord-twigs

Dacrydium Beccarii from the type-locality: mature twig

mountain forest it grows to a height of 40 m. (ca. 120 ft.). I am very doubtful if it ever becomes one of the bushes of the Bæckia-Leptospermum-scrub of high mountains: it certainly does not occur in this form in the extensive moorland-scrub of Gunong Tahan, and most such records of it in Malaya should be referred to *D. Beccarii* var. *subelatum.*

Juniperus elata Roxb. was described from trees cultivated in the Royal Botanic Gardens, Calcutta, and derived from Penang. It seems that there is no type-specimen so that Wallich Cat. No. 6045, which is generally quoted as the basis of the species, is of the nature of a neotopotype.* I have not seen Wallich's specimen but as it also came from Penang and, as only one species of Dacrydium grows there and it answers exactly to the descriptions of Roxburgh and Wallich, there can be no doubt of its identity.

In the Singapore Herbarium there are no exotic specimens, from outside Malaya, which can be referred to *D. elatum* with certainty, for none have the typical cord-twigs. The presence of the species outside Malaya has yet to be proved, though it has been reported from Tenasserim to Fiji.

Collections:—

KELANTAN: Bell 7507 (Kedah Peak 3500′).

PENANG: Curtis 2880.

PERAK: C.F. 25809 (Symington) (Kledang Saiong, 2500′): C.F. 29926, Gunong Bubu, (4000′).

PAHANG:—

Gunong Tahan, SFN 7959 (Haniff & Nur) (5500′) and 8018 (3300′), Kloss 12234 (5500′), C.F. 42941 (Strugnell) (3300′), C.F. 8216 (Woolley) (5500′), Wray & Robinson 5354, 5380 (3300′).

Gunong Chini, Henbrey s.n. 8.4.17, C.F. 31707 (Landon) (2100′ summit).

Fraser's Hill, C.F. 28962 (Arnot) (4000′), C.F. 3875 (Mager) (3300′) C.F. 20315 (Strugnell) (Gap, 2500′).

Bukit Kutu, C.F. 23835 (Osman) (2000′).

Gunong Lesong, C.F. 4155 (Watson).

SELANGOR: C.F. 12077, 12078 (cult.): C.F. 14827 (Fyfe) (Ulu Gombak, quartzite outcrop): C.F. 12626 (Strugnell) (cult.).

SINGAPORE: *cultivated,* Cantley 268 and 270, Corner s.n. 12.2.37, Holttum s.n. 17.4.31, Kiah s.n. 1.1.32, SFN 26173 (Nur), Nur s.n. 16.8.18, 20.6.24 and 15.6.26.

D. Beccarii Parlatore, D. C. Prodr. XVI pt. 2, *1868,* p. 494. **Plate 6.**

R. Pilger, Pflanzenr. Taxaceæ.

In the Singapore Herbarium there are three collections from the type-locality namely Mt. Poe in Sarawak, and,

* C. X. Furtado, Gard. Bull. IX, 1937, p. 288.

as they come from the summit-tree, they may well be fragments of the type-tree. These collections are Anderson 190, Clemens 20385 and Foxworthy s.n. July 1908. With this last collection, there is a note by Foxworthy to say that the specimen has been compared with a fragment of the type sent by Beccarii and that it agrees well. All three collections agree with the descriptions of Parlatore and Pilger except that the leaves are triagonal, not tetragonal. As all the Malaysian, needle-leafed species of Dacrydium have normally triagonal leaves (as seen in cross-section, and disregarding the slight bulge of the midrib on the adaxial side) I consider the description of them in *D. Beccarii* as tetragonal as a mistake or based on an aberration. From these specimens I feel that I have been able to define *D. Beccarii* with certainty, though I have not seen the type.

Typical *D. Beccarii,* in the taxonomic sense, has the bushy twigs and umbrella-shape of *D. comosum,* but much smaller needles. Its seeds are born singly or in pairs at the ends of the ordinary twigs (as in *D. elatum*) or laterally on very short twigs set with reduced needle-leaves (as in *D. comosum*): their cups are smooth or more or less rugosely reticulate (as in var. *subelatum*). Its habitat is exposed mountain sites from 4,000–7,000′ (9,000′ in Borneo), either in mossy ridge-forest where it reaches 20–30 ft. high or in the Bæckia-Leptospermum-scrub where it is often a bush. I believe, indeed, that most records of *D. elatum* from mountain-tops of Western Malaysia will be found to be *D. Beccarii,* particularly the variety *subelatum.* Both the typical state and the variety appear to be widespread.

The character of the leaves of *D. Beccarii* intermediate between those of *D. elatum* and *D. comosum* suggest that *D. Beccarii* is a self-perpetuating or continually originating hybrid of the other two. It is for this species that we are in need of many more observations on living trees.

Collections:—

MALAYA:—

Kedah Peak, (1000 m.), Bell 7508 and 7514, Evans and Gordon 1032, SFN 14877 (Holttum), C.F. 23162 (Marshall), C.F. 20731 (Mustafa), Robinson and Kloss 6053, C.F. 27454 (Wilkinson).

Gunong Stong (Kelantan), (2000 m.), SFN 12210 (Foxworthy & Nur), J. Jupe s.n. Sept. 1922, C.F. 37670, 37777 (Symington) (1500 m.).

Gunong Tahan (Pahang) (1700 m.), Kloss 12222, 12223, 12224.

Bujong Malacca (Perak) (1300 m.), Curtis 3302.

Gunong Benom (Pahang) F.M.S. Mus. Coll. s.n. 26.7.25.

Mt. Ophir (Johore) (1300 m.), Hullett, s.n. April 1888, Ridley 3155.

Dacrydium Beccarii var. *subelatum* type-specimen: mature twig

Dacrydium Beccarii var. *subelatum* mature twig (left) : sapling twig (right)

BORNEO:—
Mt. Poe (Sarawak) (2000 m.), Anderson 190, Clemens 20385, Foxworthy s.n. July 1908.
Sarawak, Hewitt s.n. 1900, Mjoberg 221.
PHILIPPINES:—Mt. Malindang (Mindanao), Hutchinson and Mearns 4547.

D. Beccarii var. **subelatum** var. nov. **Plates 7, 8.**

Ramulis subdimorphis: ramulorum superiorum et fertilium aciculis 3–5 (–7) × .4–.7 mm., plus minus appressus vel apicibus incurvatis, vestitis: seminum cupulis sæpissime ex integro reticulato-rugosis.

Distr. Malaya, Borneo, Labuan.

Typus. Corner 33224, Pine Tree Hill, Pahang, 1500 m.

Because its adult and fertile twigs appear like those twigs of *D. elatum* which are transitional between the bushy, sapling ones and the cord-like fertile ones, this variety has evidently passed in herbaria for a high-mountain form of *D. elatum*. After studying many trees and bushes on the upper slopes of Gunong Tahan, and the one old tree on Pine Tree Hill, I am convinced it is not *D. elatum* as that species is typically known but must be regarded as a variety of *D. Beccarii* approaching, perhaps, *D. elatum*. In the first place, the trees or bushes never develop the cord-like, fertile twigs of *D. elatum*—and I have seen old trees 30′ high with trunks 2′ thick: in the second place, the twigs are much bushier than those of *D. elatum*: and in the third place, it is occasionally impossible to decide whether a tree should be classed as *D. Beccarii* or this variety, the distinction between them being merely quantitative.

On the upper slopes of Gunong Tahan, from 5,000–7,000′, all the Dacrydium-plants in the Bæckia-Leptospermum-scrub are *D. Beccarii* and this variety *subelatum*. *D. elatum* occurs in the *Agathis flavescens* forest and *D. comosum* only in the *Leptospermum*-mossy forest on the ridges.

From the Bornean and Labuan collections it seems that this variety can grow in the lowlands: perhaps it occurs on poor, acid quartzite ridges.

Collections:—
MALAYA:—
Gunong Stong (Kelantan) (1500 m.), C.F. 37794 (Symington).
Gunong Bubu (Perak) (1300 m.), Strout s.n. 7.12.24.
Gunong Padang (Trengganu) (1300 m.), SFN 31072, 31841 (Moysey).
Gunong Tahan (Pahang) (1700–2300 m.), SFN 7994 (Haniff & Nur), Kloss 12226, Ridley 16025, Seimund 327 and 335, C.F. 42884 (Strugnell), C.F. 8217 (Woolley).
Pine Tree Hill (Pahang) (1500 m.), SFN 33224 (Corner) (type), C.F. 6519 (Cubitt), F.M.S. Mus. 11355 (Henderson), Holttum s.n. 21.3.29, SFN 11058 (Nur): (probably all these collections from the same tree).

Cameron Highlands (Pahang) (1650 m.), SFN 18025 (Henderson), C.F. 14648 (Mead).
Gunong Benom (Pahang) (1900 m.), C.F. 22321 (Strugnell).
Gunong Ulu Liang (Pahang), C.F. 20437 (Strugnell).
Gunong Tapis (Pahang) (1500 m.), C.F. 28875 (Symington).
BORNEO:—For. Dept. B.N. Borneo 4799 (lowland): Omar 00078, 00376: Posthumus 2175.
LABUAN:—C.F. 9531.
BRUNEI:—For. Dept. 28709.
(FIJI:—For. Dept. (Malaya) 2003, 2004, 2005; specimens imperfect or of seedlings, hence doubtful).

D. Beccarii var. **kinabaluense** var. nov. **Plate 9.**

Ramulorum superiorum aciculis crassioribus, .7–1.2 mm. latis, 5–11 mm. longis, rigidis: ramulorum inferum vel juvenilium acicules 12–20 mm. longis: seminum cupulis reticulato-rugosis.

Distr. Mt. Kinabalu, B.N. Borneo, 1500–3000 m.

Collections:—
SFN 26437 (type), 26588, 27599 (Carr).
SFN 18168, 18169 (Enriques).
Haviland 1183.
Holttum s.n. 16.11.31 (2 collections).

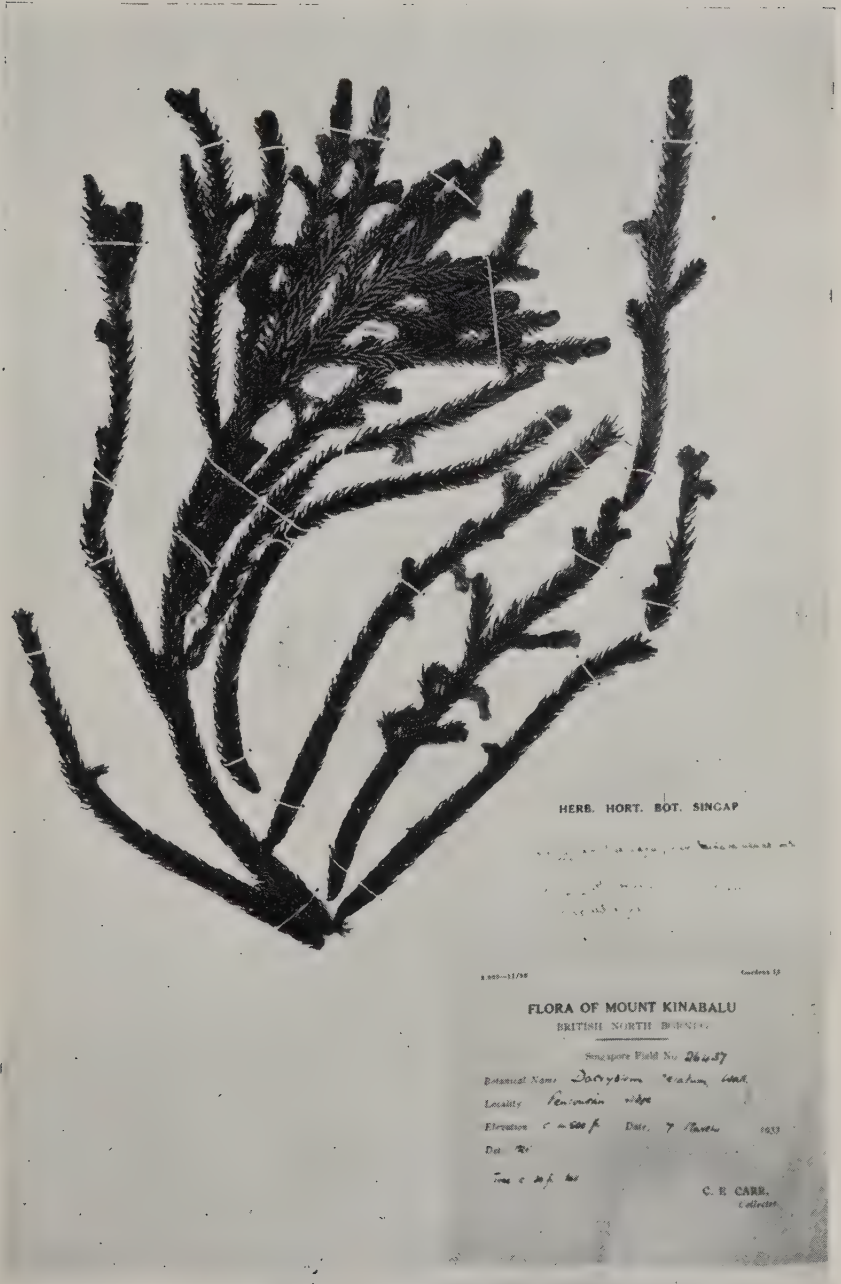
The stouter needle-leaves on the adult twigs distinguish this variety. On Mt. Kinabalu it seems to take the place of *D. Beccarii* var. *subelatum* in Malaya. It is, perhaps, *D. Gibbsiae.*

D. comosum sp. nov. **Plate 10.**

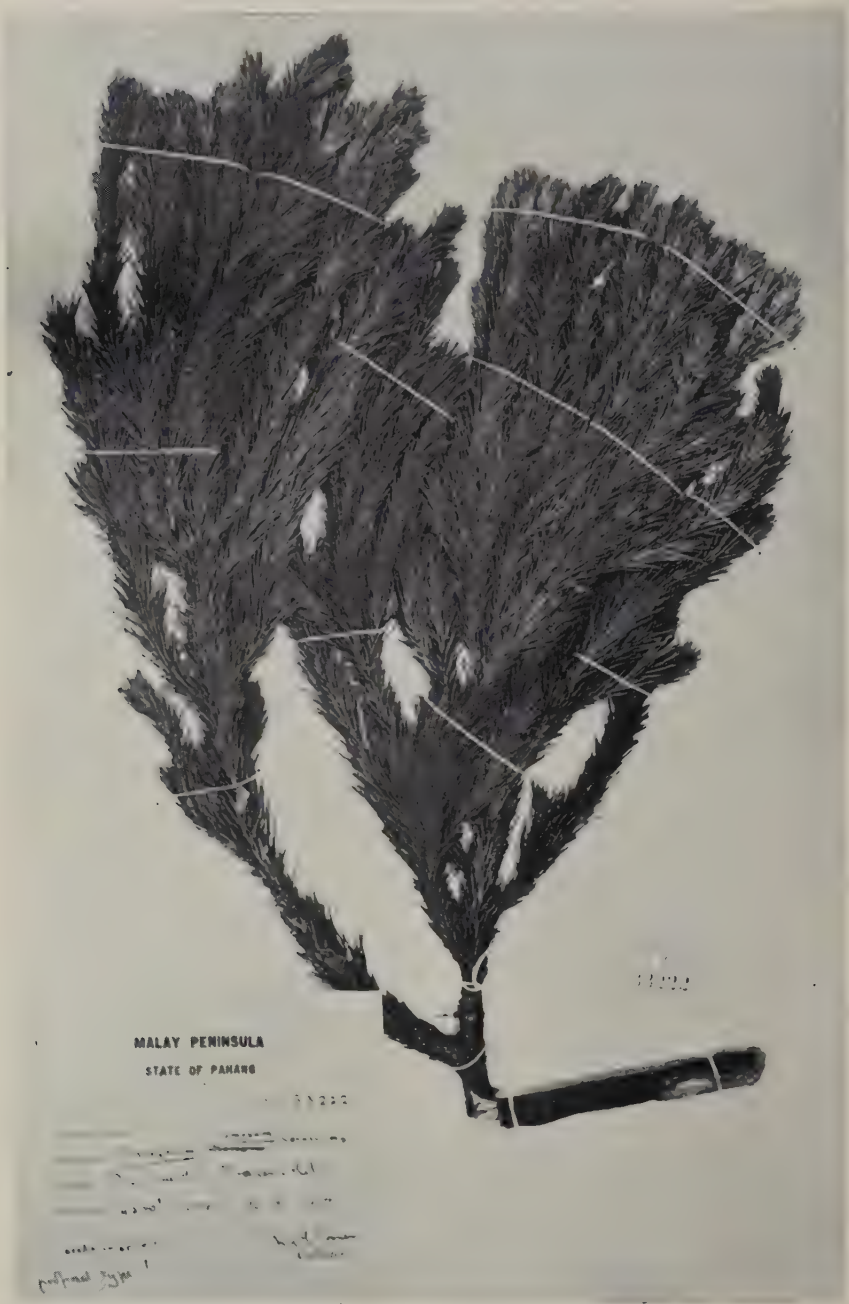
Ramulis omnino aciculis longis comoso-strigosis: ramulorum superum aciculis 12–20 × .7–1.3 mm. gradatim attenuatis, sæpe subfalcatis; arborum juvenilium aciculis 20–33 mm. longis: seminibus 4–5 mm. longis, sæpissime binis, ramulis lateralibus brevissimis productis: cupulis levibus vel vix reticulatis.

Distr. Malaya, in silvis muscosis montanis 1200–2200 m. alt.
Typus. Corner 33222, Pine Tree Hill, 1500 m.

So far as I have observed, this species is limited to the mossy forest of wind-swept mountain ridges. It does not occur on the hillsides like *D. elatum* nor in the moorland-scrub like *D. Beccarii.* There are many trees on the forested knife-edge ridges leading up to Gunong Tahan, at altitudes from 4,000–6,800 ft., and there are four trees, together with one of *D. Beccarii* var. *subelatum,* on Pine Tree Hill in Pahang. The crown is umbrella-shaped and generally compact, the branches often gnarled and misshapen from the wind. Trees twenty feet in height are common; they may reach nearly 40 feet but I have not seen them less than 12 feet and saplings seem to be curiously rare. The bark is very like that of *D. elatum* but with rather smaller flakes. The extraordinarily bushy twigs, like a long-needled Abies or a squirrel's tail, enable one to distinguish full-grown trees at a glance from either of the



Dacrydium Beccarii var. *kinabaluense* type-specimen: mature twig



Dacrydium comosum type-specimen: mature twigs

other needle-leafed species in Malaya. It appears to be a rare species, though common locally, and it is certainly our rarest Dacrydium.

The species has passed for *D. Beccarii* in the Singapore Herbarium. J. S. Gamble, however, noted on one of our sheets (Dennys, s.n. 4.3.07) that it appeared different from anything that he had seen, and that he refrained from taking it up because he considered that it needed investigation in the field.

Collections:—

PAHANG:—

Pine Tree Hill (1500 m.), SFN 8536 (Burkill & Holttum), SFN 33222 (Corner) (type), C.F. 6520 (Cubitt), F.M.S. Mus. 11354 (Henderson), SFN 21545 (Holttum), SFN 11059 (Nur), C.F. 11133 (Strugnell), C.F. 11508 (Watson).

Gunong Tahan (1500–2000 m.) SFN 8307 (Haniff & Nur), SFN 20711 (Holttum).

Gua Tinggi, Ulu Liang C.F. 20438 (Strugnell).

SELANGOR:—

Gunong Mengkuang Lebah, F. W. Dennys s.n., 4.3.07.

Gunong Ulu Kali Burn Murdoch 321.

D. Gibbsiæ Stapf.

Journ. Linn. Soc. Bot. 42, *1914*, p. 192, t. 4.

I do not see how this species differs from *D. Beccarii* and, considering that *D. Beccarii* var. *kinabaluense* appears common on Mt. Kinabalu where *D. Gibbsiae* was collected, I think *D. Gibbsiae* may prove to be this variety. Stapf remarked that *D. Gibbsiae* differed in its triagonal leaves from *D. Beccarii,* with "tetragonal" leaves but, as I have remarked, the "tetragonal" leaf is probably a mistake or an abnormality.

Discussion

In Malaya, we can recognise four kinds of needle-leafed Dacrydium from their leaf-characters. The question is, should they be regarded as species or varieties. In the extreme they might be considered varieties of one species, *D. elatum,* to be distinguished by the morphological character of its reproductive organs. This concept of *D. elatum* would cover so great a range that I doubt if it would be acceptable either in the herbarium or the field. It is foolish, too, that we should employ trinomials to distinguish the cultivated Dacrydium of the towns, which is also the big forest-tree of the mountain-sides, from the bushy elfin-Rhu of our Leptospermum-heaths and the woolly umbrella-Rhu of the mossy-forest beneath whose shade the climber toils for several hours during the ascent of Gunong Tahan. The answer turns upon 1. the interpretation of the trees which I have called *D. Beccarii* var. *subelatum,* and 2. the

fact that if more than one species is recognised, two species have been described, *D. elatum* and *D. Beccarii*, and they must be defined from their type-specimens.

Regarding *D. elatum* and *D. Beccarii*, even though I have not seen the type-specimens, I have no doubt that I have interpreted them correctly from the facts which I have already stated under each of them. *D. Beccarii* var. *subelatum* is almost exactly intermediate. It seems impossible to distinguish the mature, but sterile, twigs of var. *subelatum* from the intermediate twigs of *D. elatum*, wherefore it may be argued that var. *subelatum* is merely a variety of *D. elatum* that is unable to develop cord-twigs. But there is no hard and fast distinction between var. *subelatum* and *D. Beccarii*, it being likewise impossible to distinguish mature, but sterile, twigs of *D. Beccarii* from intermediate twigs of var. *subelatum*, and sapling leaves of both are identical. Therefore one should argue that *D. Beccarii* is merely another variety of *D. elatum* still further removed from the typical state by having persistently juvenile foliage. The one out of the four kinds which is unmistakable in both sapling and adult state, because of its large needles, is *D. comosum*.

Now, if it is impossible at times to decide whether a herbarium-specimen should be *D. elatum* or *D. Beccarii*, I have not yet seen a tree which was not certainly the one or the other. In fact, I regard the cord-twigs and scale-leaves of *D. elatum* as a qualitative difference from *D. Beccarii* in contrast to the mere quantitative distinction between *D. Beccarii* and the var. *subelatum*. There is no evidence that real intermediates between *D. elatum* and *D. Beccarii* exist, *viz.* trees with both fertile cord-twigs and fertile needle-twigs. Until such positive evidence is forthcoming that there are trees, not herbarium-specimens, intermediate between *D. elatum*, *D. Beccarii* and *D. comosum*, the simplest and most scientific course is to treat them as three species.

AGATHIS

A. flavescens Ridley.

Kew Bull. *1914*, p. 332: Fl. Mal. Pen. V. *1925*, p. 278.

The distinctness of this species has been questioned by several Malayan botanists who have suggested that it is merely a high mountain form of *A. alba*. After having purposely studied a large number of living trees of *A. flavescens* on G. Tahan in September 1937, I am able to confirm Ridley's opinion that it is a 'good species'. The small size of the male cones, the smaller, blunt, rather

conchate leaves and the smaller, top-shaped seed-cones provide constant differences from *A. alba*. At an altitude of 3,000 ft. on G. Tahan, moreover, *A. alba* and *A. flavescens* grow together equally large and are, so far as I could see, from bark-characters indistinguishable. Above 4,000 ft. *A. alba* disappears and *A. flavescens* becomes increasingly abundant until it reaches its maximum development in the upper valleys of the Teku River at 5,000–6,500 ft. Not merely is it a common member of the Leptospermum-ridge and Leptospermum-heath-forest but it also predominates on the mixed hillside forest at these middle altitudes. The yellowing of the foliage, remarked by Ridley, it has in common with many other plants above 5,000 ft., which is undoubtedly caused by the intense insolation; where it is shaded in forest, the foliage is a normal green. Many trees had just shed the male cones when I visited the mountain and so I was able to check to my satisfaction their constantly small size. I obtained almost mature female cones from four trees.

Male cones 2.4–3.5 × .6 cm.
Mature seed cones 7–8 × 6–7 cm.
Leaf-blade 2.5–6 × .8–2.5 cm.

GNETUM

Gnetum gnemon L.

In the latest monograph of the genus (Fr. Markgraf, in Bull. Jard. Bot. Buit. X, *1928*, 436 and Text. fig. 3), it is stated that the village-tree *Gnetum gnemon* (=*G. gnemon* var. *domesticum* Markgr.) is wild in the Eastern part of Malaysia, namely in the Philippines, Celebes, Moluccas, New Guinea and New Caledonia, and that to the west of Wallace's Line it is only cultivated. This opinion is expressed, also, in Burkill's Dictionary. As it is likely to become current, the following evidence that it is native much further west is now put forward.

The difficulty of discovering the origin of a cultivated plant in the East Indies, not to mention that of determining the geographical limits of any plant, is not fully realised. The following facts should be borne in mind:—

1. Many species have been in cultivation for hundreds, if not thousands of years.

2. Very large areas of land are under cultivation or, having been deprived of their virgin forest, are covered with secondary jungle which may be cultivated from time to time.

3. Fruits and seeds have been carried about by natives, especially sea-rovers who take provisions from island to island and have a habit of planting fruit-trees where they land *e.g.* coconut, betelnut, banana, tamarind.

4. Many cultivated species can survive in secondary jungle, especially on sea-shores or river-sides, long after the habitation is deserted. *e.g.* rambutan, durian, jack-fruit, tamarind, petai, meng-kudu.

5. Most parts of the East Indies are still unexplored botanically or have been very imperfectly sampled, *e.g.* most of the eastern part of Malay Peninsula from twenty miles east of Singapore for, at least, 400 miles north, and the greater parts of Sumatra, Borneo, Celebes, Timor, Flores, New Guinea and New Caledonia. Such enormous vacuities pass unheeded if our imperfect facts suggest a theory. Several species of tree not yet recorded for the Malay Peninsula, some probably being new to science, are still to be found in Singapore Island. Every new monograph diminishes the supposed endemism of the islands and the political units of the Archipelago. Every return, at another season, to a district already visited produces some new record that was overlooked through want of flowers or fruits.

6. Our knowledge of any tropical flora is ludicrously superficial, our ignorance colossal.

Any statement on the distribution of a plant in the East Indies must therefore be provisional: and when it concerns the supposedly wild form of a cultivated plant, I do not see how it can be accepted unless it is based on the detailed evidence of a botanist who has himself seen the wild specimens and *studied critically their position in the virgin forest and surrounding country.* Even then, there is but positive evidence and one should put only dots of occurrence on a map: to enclose them in a boundary is to exceed the limits of knowledge. Such remarks as "wild" or "apparently wild" on field-labels, without explanation, are misleading because the history of the locality is ignored: jungle folk may carry fruits any where. Opuntia is wild in India, Hevea and Anacardium in Malaya.

As regards *G. gnemon,* I do not find that Markgraf has considered these disconcerting propositions, supplied any evidence or has first-hand experience of the wild plant. My own explorations have satisfied me that *G. gnemon* is wild on the East Coast of Malaya. Whether it has really been found wild elsewhere, I do not know, but conjecture

that it is a plant of rocky headlands and small, rocky islands throughout the more seasonal part of Malaysia, where mangrove is in abeyance, from Siam to New Guinea. I doubt even if the plant has been altered by cultivation. My evidence is this:

I have found *G. gnemon* (= *G. gnemon domesticum* Markgr.) in abundance in the *virgin-forest* that covers rocky headlands of the N. E. end of Pulau Tioman (25 miles off the East Coast of Pahang) and that covers the little islands of P. Tulai, and P. Chibeh off this end of P. Tioman, and that of P. Duchong about 1 mile from the adjacent coast of Pahang. In these places, *G. gnemon* is a spindly tree, 15–30 feet high, in the undergrowth of the forest and is perpetuated by numerous saplings: it flowers and fruits readily. The forest in all these places, is fronted with a Terminalia-Barringtonia formation into which the Gnetum seldom penetrates. On the headlands of Pulau Tioman and P. Tulai the lowland forest ascends the hillsides immediately behind, as a continuous canopy from the wave level. On P. Chibeh there is only a high *Eugenia grandis* forest of trees 80 feet or so tall, mixed with other big coastal trees as some species of Ficus (Urostigma), *Pisonia excelsa, Myristica guattariifolia* and *Knema missionis*: coconuts have been planted on the east side of the island. On P. Duchong the forest is similar to that of P. Chibeh but contains abundant *Podocarpus polystachyus* 60 feet high with trunks 2 feet thick, that bespeak the age of the forest. Except the small clearing on P. Chibeh, there is no sign of interference with the natural vegetations on these two islands or on the headlands of P. Tulai and P. Tioman. I found no stumps, bracken, ressam or plants of secondary jungle, such as Macaranga, Mallotus, Adinandra, Eurya, Morinda, or miscellaneous species of Eugenia and Ficus, but only the typical, mixed forest of virgin character containing big old, moribund trees, erect and fallen decaying trunks, and dead limbs upheld by climbers.

It is clear that the Gnetum can thrive and maintain itself in such virgin forest. On other islands where the forest has been extensively felled, as on P. Babi and P. Setindan off the coast of Johore, there is typical secondary jungle *without* the *Gnetum*. Nevertheless, one can maintain that the Gnetum was introduced long ago by sea-rovers and this objection can never be overcome. But I put forward these remarks to meet it:—

1. The Gnetum is a very uncommon village tree in Malaya, except in the town of K. Trengganu and I have not seen a single specimen in cultivation on P.

Tioman or on the neighbouring coast of Johore and Pahang, though a few there may be, and I have walked along most parts of the Pahang coast, from Rompin to Kuantan.

2. The Malays generally prepare the seeds for food, by making them into a kind of flour, as soon as they are gathered and thus the Gnetum is not so easily distributed by man as other fruit-trees.

3. If the Gnetum is an introduced tree that spreads easily in the forest, it is odd that it should have escaped only in these undisturbed places.

4. If the Gnetum is not wild in these places, where all its vegetable companions are, I do not see how one can prove that it is anywhere wild.

5. The Gnetum also occurs in great abundance in the secondary jungle on P. Merambong, just west of Singapore. This island is partly inhabited but it is evident from the coppice-shoots on big stumps of Sepetir (Sindora) and from the Terminalia-Barringtonia formation with which part of it is still fringed that it was mostly covered with high forest until a few years ago. The secondary jungle consists mainly of saplings of typical coastal trees as *Memecylon coeruleum, M. ovatum, Eugenia grandis, Planchonella obovata, Adenanthera pavonina, Podocarpus polystachyus* etc., as on the Pahang island, P. Duchong, and the typical secondary jungle-plants of Singapore island are only just beginning to get a footing. From which evidence, I judge that the Gnetum is also a relic of the original vegetation. But this island, by itself, being so near habitation and lines of commerce of long standing, would supply no certain evidence.

Now, on these islands and headlands on the East Coast of Malaya, the climate is distinctly seasonal, having an alternation of dry and wet weather similar to that of Siam and East Java, though less pronounced. Many plants of monsoon climates reach down the East Coast but are absent from the greater part of the Peninsula *e.g. Taraktogenos ilicifolius, Sterculia foetida, Kleinhovia hospita, Pemphis acidula, Tournefortia argentea, Spinifex littoreus, Pisonia excelsa, Stauropsis gigantea.* I conclude that the Gnetum is native in such seasonal, littoral, rocky, not very high forest; and therefore that it is likely to occur wild on the north coast of Borneo, the East and South coasts of Java and perhaps also the West coast of Sumatra; and that its distribution has no connection with Wallace's Line.

PODOCARPUS

P. deflexus Ridley.

Fl. Mal. Pen. V, *1925*, p. 283.

This strikingly distinct species is known only from the upper slopes of Gunong Tahan where it is abundant in the *Agathis flavescens* forest which fills the upper valleys of the Teku watershed from an altitude of 4,800–6,500 ft. It is unlikely that it occurs on any other Malayan mountain or, indeed, in another country because imperfect as the botanical exploration of the Malaysian region still is, a fair sample of mountains has been visited and such a curious tree could not have been overlooked. Our knowledge of it is still deficient: male cones have not been collected and Ridley's description of the seed is incorrect and misleading. It seems to be most nearly allied with *P. Rumphii* but its strongly deflexed leaves with longer petioles, its slightly fissured bark (deeply rugose-fissured in *P. Rumphii*) and its twin-ovules on the receptacle are different. This last feature, indeed, appears remarkable in the genus.

The following are my notes on the species, derived from observations of numerous trees in September 1937, all of which unfortunately were sterile, and from the herbarium specimens at Singapore:—

> A straggling shrub to a moderate-sized tree, 40 feet high: *the crown* monopodial but always open and uneven from the straggling, untidy branches and deflexed leaves, casting little shade: *bark greyish brown becoming rather shallowly fissured longitudinally* but never rugose, thin, the inner bark pink or reddish: *leaves strongly deflexed* (not merely drooping), more or less vertical though rather spreading in the sapling, *the blade* 9–28 × .8–1.2 cm., *yellowish green* (light brown and shiny when dried), *very long, narrowly ligulate,* tapered gradually to a subacute apex and *tapered gradually to a rather long petiole* (4–11 mm.): *seeds* 1.3 × 1.1 cm., ovoid, *borne in pairs at the end of the swollen, clavate, sub-bifid receptacle* as big as the seed and borne on a slender stalk ca. 1.3 cm. long, solitary and axillary.

Podocarpus imbricatus Bl.

The predicament in which this species was recently placed proves only too well the uncertainty of supplanting well-established botanical names with those of older forgotten species the type-specimens of which do not exist or have not been re-examined so that their interpretation depends solely on inadequate descriptions. In 1921 (Philipp. Journ. Sci. 19, p. 338) Merrill identified *Thuja? javanica* Burm.f. with *P. imbricatus* and, on proposing the new combination *P. javanicus,* recommended its use to botanists. Later, Merrill discovered that Hallier, on the evidence of an authentic specimen in Leiden herbarium, had identified

Burman's species with *Juniperus chinensis,* and accepting Hallier's opinion with reservation, he returned to Blume's name (Contrib. Arn. Arb. *1934,* 8, 14). Even if the Leiden specimen is not Burman's original, I feel that Hallier's opinion can be accepted because it is easy to find twigs of *J. chinensis* that agree exactly with Burman's figure. In any case, Burman's species is certainly not *P. imbricatus* because the figure shows blunt, decussate, "cupressoid" leaves and a manner of branching unlike *P. imbricatus,* add to which the fact that a collector of *P. imbricatus* could scarcely fail to take specimens from those twigs which have dimorphic ramuli, for they are much the more conspicuous and obvious, and such were not mentioned by Burman.

P. javanicus (Burm.f.) Merrill is thus a synonym of *Juniperus chinensis* L. (1767). *P. javanicus* Merrill (Journ. Arn. Arb. *1934,* 8, 14) is a nomen nudum or rather, as it is given in a synonymy, it belongs to an unnamed category of invalid names.

P. neriifolius Don.

Lamb. Pin. Ed. I. *1824,* p. 21.

This species has as great range of habitat as any tree in Malaya, if not the greatest. I have found it, (1) with *Podocarpus polystachyus* on the East Coast of Johore in the Barringtonia-Terminalia-formation of sandy and rocky coasts; (2) with *P. polystachyus* in the inland mangrove swamps; (3) in the fresh-water tidal swampy forest that surrounds the Sedili River in Johore where it is a common top-storey tree both on the raised Tristania-banks and on the partly submerged muddy flats behind the array of *Pandanus helicopus;* (4) in the ordinary lowland forest of the East of Johore; (5) on the rocky banks of the Tahan River in Pahang along with the Nyeram-trees (*Dipterocarpus oblongifolius*) where it frequently reaches 120′ high; (6) at 1,500 ft. on Gunong Panti in Johore, 2,000 ft. on Penang Hill and in the true mountain forest of the main-range at 4,000–6,000 ft., where it has most frequently been collected in Malaya; (7) in the transition-forest between the tall *Agathis-flavescens*-forest and the *Leptospermum-Baeckia*-moorland-scrub on G. Tahan at an altitude of 5,000–7,000 ft. It occurs, that is, throughout the virgin forest of Malaya except, perhaps, on limestone hills: and it is not found in lowland secondary jungle.

Nowhere is it dominant, but wherever it grows it enters into the highest stratum of the forest-canopy.

CAMPNOSPERMA

The botanical names of the Malayan species have been so confused that it is doubtful whether any information concerning them can be safely acknowledged without a check on the authors' identifications.

Key to the Malayan Species

Lamina hairy beneath; petioles hairy, not auricled	*C. macrophylla*
Leaves glabrous	
Base of petiole with 2 auricles distinct from the petiolar wing; branches of the male inflorescence themselves branched; female inflorescence branched; fruit 6–8 mm. long	*C. auriculata*
Base of petiole without auricles, the petiolar wing ending abruptly; branches of the male inflorescence unbranched; female inflorescence unbranched; fruit 15–16 mm. wide	*C. minor*

C. oxyrachis (Miq.) Engler

DC Mon. Phan. 4, *1883*, p. 320.

This species has been recorded for Malaya by Ridley but there are no specimens of it in the Singapore herbarium. I do not see how to distinguish it from young, precociously flowering trees of *C. auriculata*.

C. auriculata (Bl.) Hook.f.

F.B.I. 2, *1876*, p. 41.

Basinym:—

Buchanania auriculata Bl., Mus. Bot. Lugd. 1, *1850*, p. 185.

Interpretations:—

C. auriculata Hook. f. sensu Engler, DC. Mon. Phan. 4, *1883* p. 320.

Synonyms:—

C. Griffithii March. Rev. Anacard. *1868*, p. 174, sensu Hooker et Engler: non sensu King et Ridley.

C. Wallichii King, Mat. Fl. Mal. Pen. 2, *1896*, p. 783.

C. auriculata var. *Wallichii* Ridley, Fl. M.P. 1, *1922*, p. 534.

The identity of this, which is the commonest Malayan species, has been curiously confused. That there were two species with rather similar glabrous leaves in Malaya was understood by King but he described as new, under the name of *C. Wallichii*, the one which (according to Engler) had already been described as *B. auriculata* Bl. The undescribed species King identified with *B. auriculata* Bl.; and this error has been perpetuated in Malayan botany. The really new species I describe below as *C. minor*.

Now there is nothing in Blume's description of *B. auriculata* to decide which of the two species he had in hand. However Engler, in examining the specimens from Sumatra and Borneo on which Blume evidently founded his species, has left no doubt by his words *"petiolo supra basin auriculis 2 rotundatis instructo* ..... Drupa circ. 5 mm. longa, 4 mm. crassa," which apply to *C. Wallichii* King.

As I have stated under *C. Griffithii,* it must be regarded as a synonym of *C. auriculata,* though part of Griffith's No. 1109 is *C. macrophylla* (Bl.) Hook. fil.

C. macrophylla (Bl.) Hook. fil.
F.B.I. 2, *1876,* p. 41.
Basinym:—
Buchanania macrophylla Bl., Mus. Bot. Lugd. 1, *1850,* p. 185.
Interpretations:—
C. Griffithii March., sensu King, Mat. Fl. Mal. Pen. II, *1896,* p. 780.
C. macrophylla Hook. f., Engler in DC Mon. Phan. IV, *1883,* p. 316.
C. Griffithii March., sensu Ridley, Fl. Mal. Pen. I, *1922,* p. 534 *pro parte.*

As a Campnosperma with large leaves hairy underneath, with many pairs of side-veins (16–36), and with stout, narrowly winged, adpressedly tomentose petioles without auricles, this species is well-defined. Engler's amplification of Blume's description sets its identity beyond doubt. It appears, however, that Ridley confused it with *C. auriculata* under the name *C. Griffithii* because it is not "common in damp forests" in Malaya, but so rare as to have escaped collection by the Singapore botanists for 50 years. I have also searched particularly for it during the last two years but without success. Our common Campnosperma, which is to be seen everywhere in secondary jungle and bordering forests, is the true *C. auriculata* Bl.

C. Griffithii March.
Rev. Anacard. *1868,* p. 174.

It appears that this species is a synonym of *C. auriculata* and not of *C. macrophylla* as given by King & Ridley. It was based on the Malaccan collection, Griffith 1109, which, however, is mixed. King identified *C. Griffithii* with *C. macrophylla* but Marchand made no reference to any hairiness of blade or petiole in his description so that one must assume that *C. Griffithii* was intended to have glabrous leaves and therefore could not be *C. macrophylla*: and such is Engler's interpretation (D.C. Mon. Phan. IV, p. 320).

Mr. C. E. C. Fischer has kindly examined at my request the specimens of Griffith's 1109 at Kew and had them compared with the sheet of the same number in Paris: for the following remarks I am indebted to him. There are 4 sheets of 1109 at Kew (one marked in ink, 3 in pencil). Of these, the sheet marked in ink agrees with that in Paris, though the Kew-sheet has fruit and the Paris-sheet has flowers and a capsule containing fruits different from those on the Kew-sheet. The leaves of these two sheets are glabrous and have about 16 pairs of side-veins spaced .75–1″ apart along the midrib; there are no basal auricles to the

petiole but the panicle is wide. Hence I conclude that these two sheets represent *C. auriculata* Bl. from which the basal auricles on the petiole have fallen or in which they have not been developed (as is sometimes the case) or its sapling leaves in which the auricle is not separate from the petiolar wing. If these be regarded as the type-sheets, then *C. Griffithii* is a synonym of *C. auriculata.* The other three sheets at Kew have small leaves, hairy beneath, with densely matted-hairy petioles and about 32 pairs of side-veins spaced .25–.5″ apart on the midrib. Clearly these three sheets are *C. macrophylla.* It is to be noted that Engler referred this number of Griffith's to *C. macrophylla* as well as to *C. Griffithii.* This confusion of two species under one number explains the different treatment of *C. Griffithii* by Hooker and King, the former clearly intending *C. auriculata* and the latter *C. macrophylla.*

C. minor nov. spec.

Pseudonym: *C. auriculata* (Bl.) Hook. f., sensu King, Mat. Fl. Mal. Pen. 2, *1896,* p. 782: sensu Ridley, Fl. Mal. Pen. 1, *1922* p. 534.

A *C. auriculata* vera differt *lamina minore, petiolo ad basin non auriculato,* alis petioli abrupte terminatis, pede petioli 2–8 mm. longo exalato, *inflorescentia mascula minore ramis sine ramulis, inflorescentia feminea non vel vix ramosa multo minore, flore masculino majore* pedicello crasso, *fructu multo majore subgloboso.*

Habit. in sylvis paludosis peninsulæ malayanæ.

Collections:—

Pahang: C.F. 2717.

Selangor: C.F. 8048, 10294, 12791: C.F. 490, 2334, 4912, 7032.

Johore: SFN 7835 (Best): Corner s.n. 28.8.32: Lake & Kelsall s.n. 6.11.92.

Singapore: Baker s.n. 4.11.17: Burkill s.n. 1.6.14: SFN 26021, 32517, 32523, 32531 (Corner): Cantley s.n.: Goodenough 4775: Kunstler 1218: Nur s.n. 28.10.17: Ridley 444, 9521, s.n. 1893, s.n. 1889.

Type-collection: SFN 7835 (G. A. Best), Gunong Pulai Road, Johore, 18.12.22.

The confusion of this species with *C. auriculata* I have explained under that species. *C. minor* is common in Malaya but, so far as my observations extend, it occurs only in the lowland swampy forest, for which reason it may be expected also in Borneo and Sumatra. There is never the least difficulty in distinguishing sterile, flowering or fruiting specimens from true *C. auriculata,* and living trees are told at once from the size of the leaf.

The sapling-leaves of both *C. auriculata* and *C. minor* are much larger than the leaves of mature trees. In both species, the petiole of the sapling leaf is broadly winged

almost to the base and has a round, amplexicaul auricle continuous with the wing. In the case of *C. auriculata* the auricle separates from the petiolar wing in the mature and intermediate foliage: in the case of *C. auriculata* the auricle disappears. The sapling leaves of *C. auriculata* are 2½–4 feet long: in *C. minor* they are 1½–2½ ft. long: in both they are obovate-lanceolate and pointed.

C. brevipetiolata Volkens seems very closely allied with *C. minor* but I hesitate to identify the Malayan plants with *C. brevipetiolata* of the Caroline Islands until it is better known. It seems that only the type-collection of *C. brevipetiolata* is known, namely Volkens 353. I have examined the duplicate at Buitenzorg which was kindly sent to me on loan. *C. brevipetiolata* has the short petiole and abrupt, subauriculate base to the decurrent lamina as *C. minor* but the venation is closer, particularly in the almost parallel secondary veins connecting the primary lateral veins: and the male flowers of *C. brevipetiolata* are subglabrous and have the slender shape and small size of those of *C. auriculata.*

C. auriculata—Blade 15–40 × 6.5–18 cm. generally retuse, petiole narrowly winged *with 2 distinct auricles at the base.*	*C. minor*—Blade 10–30 × 4–10 cm., blunt or shortly and bluntly tipped, petiole narrowly winged, the wing ending abruptly 2–8 mm. from the base and *without auricles.*
Male inflorescences 26–50 cm. long, the lower branches 7–15 cm. long and themselves branched.	Male inflorescences 10–26 cm. long, the lower branches up to 5 cm. long and unbranched.
Female inflorescences 15–36 cm. long, with branches 3–10 cm. long, themselves unbranched or with very short branches.	Female inflorescences 5–13 cm. long, unbranched.
Male flowers 2–2.5 mm. wide, the buds 1 mm. wide, the petals .5–.8 mm. wide, the pedicels slender 1–1.5 mm. long.	Male flowers 3–3.5 mm. wide, the buds 1.5 mm. wide, the petals 1–1.5 mm. wide, the pedicels rather stout.
Fruits 6–8 mm. long, 5–6 mm. wide, oblong, ripening dull reddish purple.	Fruits 17 × 16 mm., subglobose, ripening green with white speckles.

VITEX

V. trifolia, V. negundo and V. ovata

The creeping Vitex, which is such a conspicuous plant on the shores of the Indian Ocean and Western Pacific, has attracted my attention because it is generally classified as a variety of *V. trifolia.* Several authors have stated that

there are intermediates between it and *V. trifolia,* but I have never been able to find an intermediate though I have seen hundreds of wild plants of both sorts and, on a few occasions, both species growing side by side. The differences between them lie mainly in the inflorescence, flower, fruit and habit, not merely in the foliage—whether simple or trifoliate—as previous authors have indicated. I conclude from my study of the living Malayan plants that the sea-shore Vitex should be maintained as a distinct species, *V. ovata* Thunb., and that *V. negundo* var. *bicolor* seems to be a fertile hybrid between *V. negundo* and *V. trifolia* so that it would be better to unite these two species instead of *V. trifolia* and *V. ovata,* the existence of intermediates between which I regard as unproven.

I give first my critical descriptions of *V. negundo, V. trifolia* and *V. ovata* and then my reasons for maintaining *V. ovata* as a species.

Vitex trifolia L.

Erect shrub, reaching 5 m. high and developing a stocky trunk.

Leaves 3-foliate, often 1-foliate below the inflorescence or at the base of new shoots: *leaflets never toothed, generally very finely hairy on the upperside,* blunt or slightly pointed, *not long-tipped: middle leaflet sessile* or without a distinct stalk: petiole 1–2½ cm. long.

Inflorescence as a narrow, continuous, panicle up to 20 cm. long × 5 cm. wide: cymes of the lower part of the panicle 1–3 cm. long, lax and few flowered, with a peduncle 5–15 mm. long.

Calyx (at anthesis) 2–3.5 mm. long, with 5 slight teeth and 5 ribs.

Corolla 8–10 mm. long (overall), *light blue, the lower lip with a white-bearded throat.*

Fruit 5–6.5 mm. long, broadly oblong, *about twice as long as the fruiting calyx.*

Vitex negundo L.

Like *V. trifolia* but:—

Leaves 3–5 foliate: *leaflets* often toothed or nearly pinnatifid, *tapered to a long point, generally glabrous on the upperside* (except the midrib), *the middle leaflet distinctly stalked:* petiole 2½–6½ cm. long.

Inflorescence as a lax, broad panicle with long spreading branches, the whole 10–40 cm. long and nearly as wide: cymes dense, seemingly whorled, with rather numerous close-set flowers, the cymes in the lower part of the inflorescence .5–2 cm. long (occasionally 3 cm.) with their peduncles only 1–3 mm. long (rarely 10 mm.).

Calyx (in anthesis) 1.5–2 mm. long, shorter, ribbed, with 5 pointed, distinct teeth.

Corolla 6–8 mm. long, *pale to deep blue,* often speckled, *generally with a yellow horseshoe-shaped mark on the lower lip.*

Fruit 3–4 mm. long, *scarcely longer than the fruiting calyx.*

V. negundo var. bicolor H. J. Lam

Leaves as in *V. negundo* but shortly tipped.

Inflorescence as *V. trifolia* but in some cases with the branches nearly as strongly developed as in *V. negundo*, the whole up to 22 × 18 cm.: cymes as in *V. trifolia*, lax, in the lower part of the panicle 2–9 cm. long with peduncles .5–3 cm. long.

Flowers as in *V. negundo:* calyx .15–.2 cm. long, the teeth only moderately distinct: corolla .5–.8 cm. long.

Fruit 5 mm. long, as in *V. trifolia.*

This variety is so curiously intermediate between *V. negundo* and *V. trifolia*, that one cannot doubt that it covers their hybrids.

Vitex ovata Thunb.

Syn:—

V. trifolia var. *unifoliolata* Schauer
V. trifolia var. *simplicifolia* Cham.
V. trifolia var. *repens* Ridley

A prostrate shrub on sandy sea-shores, *with long creeping runners*, reaching 10 m. long, *rooting at the nodes*, flowering on short upright leafy shoots 15–50 cm. high.

Leaves generally simple, occasionally trifoliate; *lamina* 1–5 × .8–4 cm., *obovate, blunt* or at most subacute, thinly grey hairy on the upperside, petiole .2–1.2 cm. long.

Inflorescence 3–13 cm. long, 2 cm. wide, as a *very compact and narrow panicle:* the cymes very short, few-flowered, with peduncles 1–5 mm. long.

Calyx 3.5–4 mm. long, faintly ribbed, with 5 very short teeth: *corolla* 1.2–1.4 cm. long, *rich lilac blue.*

Fruit 5–6 mm. long, round, *for a long while covered by the enlarged calyx, eventually splitting the calyx along one side.*

Reasons for maintaining VITEX OVATA

1. In habit, inflorescence, leaf, flower, and fruit *V. ovata* is more distinct from *V. trifolia* than *V. trifolia* is from *V. negundo.*

2. Although it has been stated that intermediates between *V. ovata* and *V. trifolia* occur, I cannot find that the supposed intermediacy of a specimen has been analysed. It seems that the floral characteristics of *V. ovata* have been overlooked and incorporated in the description of *V. trifolia* thereby giving the false impression that *V. ovata* differs only in leaf from *V. trifolia.* (The floral characters of *V. trifolia* have thus been misunderstood and, also, therefore the affinity of *V. negundo* var. *bicolor*). I have searched on many occasions for the supposedly intermediate plants but, among hundreds of plants of *V. ovata* that I have seen on the shores of Malaya, there was never one that I considered intermediate. At Kuala Pahang, K. Kemaman, and K. Trengganu I found plants of *V. trifolia* in the coastal villages and *V. ovata* on the shore but no intermediate. In the old sand dunes, however, which lie in the secondary jungle and in the Casuarina-woods and which

are situated some fifty yards behind the advancing front of Casuarina, there are old plants of *V. ovata* which bear a false resemblance to *V. trifolia.* These plants originated on the open shore and for various reasons have persisted in open spaces while the Casuarina-wood has advanced seawards. They have woody stems, 2–3 cm. thick, and long creeping woody branches lying on the sand from which weak straggling flowering branches ascend, to a height of 1 metre at most, but they are overgrown by other plants and are moribund. A few weak upright stems, ½–1 m. high, may be thrown up from the stocks of these plants but they flop over and become decumbent. These old plants, therefore, never become upright and they are killed eventually by the growth of forest-trees on the sandy shore. From these observations, one may conclude that *V. ovata* is a creeping shrub of open seashores and that it never becomes upright like *V. trifolia.*

3. It has been said, by Ridley for instance, that when plants of *V. ovata* are grown inland they develop into bushes like *V. trifolia,* so that the distinction between them would appear to be due to external factors and not to hereditary variations. To test this statement, I collected seed in June, 1932, from typical plants of *V. ovata* on the sand-dunes at Pahang Tua on the coast of Pahang. Ten plants were raised and grown in fairly good, not sandy, soil in the "Nursery" at the Botanical Gardens, where plants of *V. trifolia* and *V. negundo* were also growing. The ten plants developed without exception into typical *V. ovata*: they never became truly upright but they threw up weak branches which reached ½–1 m. high then flopped over and rooted at the ends or turned up again in the manner of a bramble (Rubus). This habit never altered during four years by which time the plants were nearly dead. The conditions for their growth were clearly unsuitable: the light was not strong enough, perhaps, or the air was too damp. The plants appeared like the old specimens which persist in the Casuarina-woods. Their leaves were all simple and typical of *V. ovata,* also the inflorescences and flowers, so that one would say from herbarium specimens that they were old straggling plants of *V. ovata* from the sand-dunes. Clearly, therefore, *V. ovata* does not turn into *V. trifolia* when grown inland.

4. At Pangkor, on the coast of Perak, I found in 1936 a few old plants of *V. trifolia* growing in the open sandy scrub by the village, at distances of 6–15 m. from the high-tide mark. In such a place, *V. ovata* would have been at home with long flowering runners. These plants of *V. trifolia* were upright, 2-3 m. high, though the branches were

drooping, and one had developed a woody trunk over 1 m. high and 7.5 cm. thick. Most leaves were trifoliate and the inflorescence and flower were typical of *V. trifolia.* Then, in 1937, I found clumps of *V. trifolia* growing on the bare banks of riversand by the Trengganu River some twenty miles inland. These plants were lax sprawling shrubs, 1–2 m. high, with rather decumbent stems but never creeping or rooting at the nodes. Many of the leaves on the lower parts of the branches and on the upper parts just below the inflorescences were unifoliate, but the inflorescences, flowers and fruits were typical of *V. trifolia.* Again, in such open, hot, loose, sandy soil *V. ovata* would surely have developed luxuriant runners. The converse, therefore, is also true that *V. trifolia* in the habitat of *V. ovata* does not assume the characters of *V. ovata.*

From these facts, I conclude that the conspecificity of *V. ovata* and *V. trifolia* is refuted. In nature, in Malaya, the two always retain their distinctive characters wherever they grow.

ANACARDIACEAE

Melanorrhœa

The identification of the Malayan specimens has become so confused that no specific exactitude can be given to the general information concerning them.

M. Wallichii Hook. f. and **M. Woodsiana** Scort. ex King

In Ridley's Flora these species are confused. These are the differences:—

M. Wallichii	*M. Woodsiana*
Twigs almost glabrous	Young twigs and petioles light brown hairy.
Lamina up to 16 × 8 cm., rather obovate, blunt or bluntly subacuminate	Lamina 16–32 × 6–13 cm., rather broadly elliptic to oblong, acute.
Side veins 11–15 pairs	Side veins 17–25 pairs.
Petiole 1.2–3.2 cm. long	Petiole 2.5–5 cm. long.
Bracts 3–4 mm. long, soon caducous	Bracts 5–6 mm. long, clasping the flower buds and conspicuous.
Petals white, 4–6 × 1.5–2 mm.	Petals white with yellow base 6–7 × 2.5–3 mm.

The bark of *M. Woodsiana* is distinctly rugose-fissured while that of *M. Wallichii* is scarcely fissured but rather flaky. *M. Wallichii* is a tree of swampy forest, while *M. Woodsiana* is a hillside tree or one of dry ground. Both are common.

M. malayana nom. nov.

Synonym: *M. pilosa* Ridley, Kew Bull. *1931*, p. 448; non *M. pilosa* Lec., Bull. Soc. Bot. Fr. 54, *1908*, p. 608.

A specimen of the type, C.F. 2739 (Lambak), is at Singapore as well as a specimen of the paratype C.F. 3636 (Yeop). I refer also the following collections to *M. malayana*:—

C.F. 16524 (det. *M. torquata*), 8357 (det. *Campnosperma auriculata* and *M. aptera*), 14077 (det. Melanorrhœa).
SFN 10729 (det. *M. aptera*), 34967.
Corner s.n. 9.6.34, 7.2.35, 28.6.36.

M. malayana appears to be limited to the East of the main range, occurring so far as is known only in Pahang, toward the East Coast, and in the middle and East of Johore.

Pentaspadon

Synonym: *Microstemon* Engler, Bot. Jahrb. I, *1881*, p. 376: DC. Mon. Phan. IV, *1883*, p. 294.

As originally defined, Microstemon was a monotypic genus based on a collection of a Malaccan plant (Maingay 464) called *M. velutina*. Engler distinguished Microstemon from Pentaspadon, to which Hooker had doubtfully referred Maingay's collection, by ascribing a symmetrical 3-lobed stigma and an apical insertion of the ovule in the ovary to Microstemon, in contrast with the unilateral, shortly spathulate stigma and basal insertion of the ovule in Pentaspadon. Now, though I have not seen Maingay's collection, I have dissected the flowers of 9 collections of *M. velutina* and I find that Engler's description of the stigma must have been mistaken. I find the stigma, in all these collections, unilateral and simple as in Pentaspadon but with the distal half of the stigma much more strongly recurved so as to be pressed back against the short style, round the sides of which it may bulge: and hence, no doubt, the false appearance of a terminal lobed stigma may present itself. That these collections are conspecific with Maingay's I have no doubt because one of them (Kunstler 7417) was identified by King and all agree exactly with Engler's description in other respects. The chief generic difference from Pentaspadon thus disappears and, regarding the position of the ovular stalk, it should be realised that the "generic" difference is a displacement of only 50–100 microns (the ovary being exceedingly minute) so that, if genera of timber-trees can be separated on such microscopic measurements, field-botanists may well despair.

But the necessity for reducing Microstemon to Pentaspadon must have presented itself to anyone who has studied the species in the field. In panicle, tiny flower with minutely papillate petals, sterile and fertile stamens, fruit,

bark, pinnate leaf and general aspect, *Pentaspadon officinalis* and *M. velutina* are exceedingly similar.

As regards *M. Curtisii* King, I do not know to what genus it belongs. It has a short straight style tipped with a few papillæ. The disc and ovary, moreover, are glabrous (hairy in Pentaspadon and *M. velutina*). It may be that it should be made into a new genus, but it is yet too little known to be classified accurately.

Hence, *M. velutina* must be known as *Pentaspadon velutinus* Hook. f. as originally described (F.B.I. 2, *1876*, p. 28). And *M. Curtisii* had better be called *Pentaspadon Curtisii* (King) nov. comb. in the meantime.

TILIACEAE

Grewia

In his monograph of the Tiliaceæ, Burret has distinguished Microcos from Grewia and has assigned most of the Asiatic species to Microcos (Notizbl. Bot. Gart. Mus. Berl. 88, *1926*, p. 601, 757). The main difference, and apparently the only constant one, lies in the style which has a punctiform stigma in Microcos but a more or less peltate, lobed or laciniate stigma in Grewia. I do not consider such a difference of generic value, myself, and so I have followed the customary interpretation of Grewia, which in the wide sense is a natural and easily recognised genus. Nor do I agree with Burret that Microcos has only terminal inflorescences: in several Malayan species as *Grewia antidesmaefolia* and *G. fibrocarpa*, axillary inflorescences are, *ipso facto*, the commoner.

G. blattæfolia nom. nov.

G. latifolia Mast., F.B.I. 1, *1874*, p. 392: non *G. latifolia* Muell. ex Benth. Fl. Austral. I, *1863*, p. 271.
Microcos latifolia (Mast.) Burret, loc. cit. p. 781.

Master's name, being a later homonym, cannot stand either in Grewia or in Microcos. The new name which I give refers to the leaf-shape, like a cockroach's wing.

STERCULIACEAE

Pterospermum

P. acerifolium Willd.

This species has not been recorded for Malaya but the following collections, which have been identified as *P. diversifolium*, belong to *P. acerifolium*, having the characteristic stipules and larger leaves, flowers and fruits of this species.

KELANTAN: Kuala Krai, SFN 10158 (Haniff & Nur).
PERLIS: Bukit Ketri, SFN 22988 (Henderson).
PAHANG: Gunong Sennyum, SFN 22299 (Henderson); Tembeling SFN 24806 (Henderson).
MALACCA: Batu Tiga, Derry 1170.

SAPINDACEAE

Mischocarpus

The well-established names, *M. fuscescens* Bl. and *M. sundaicus* Bl., have recently been changed by Merrill to *M. flexuosus* (Lour.) and *M. oppositifolius* (Lour.) (Trans. Am. Phil. Soc. XXIV, pt. 2, *1935*, pp. 249, 250). But there is no proof that Blume's species can be identified with Loureiro's so that the new combinations are matters of opinion which can easily be disputed. The identification of Loureiro's species is still doubtful and therefore I consider that the new combinations cannot supplant Blume's names.

With regard to *M. flexuosus* (Lour.), this is based on *Vateria flexuosa* Lour. Vateria is said by Loureiro to have 40 stamens (8 or less in Mischocarpus). The petals of Vateria are said to be connivent and as long as the stamens, whereas the petals of *M. fuscescens* are minute and much shorter than the stamens. If *V. flexuosa* is a Mischocarpus, then it may be *M. pentapetalus*.

With regard to *M. oppositifolius* (Lour.), it is based on *Pedicellia oppositifolia* Lour. Loureiro's description certainly suggests Mischocarpus but it is impossible to decide whether the apetalous state of *M. fuscescens* (= *M. sumatranus*) or *M. sundaicus* is intended.

Moreover, as Merrill admits, in neither case does Loureiro describe the leaves as pinnate.

However interesting it may be to try to discover what Loureiro was describing, surely only the fullest proofs can persuade botanists to make radical nomenclatural changes based on Loureiro's descriptions.

MELIACEAE

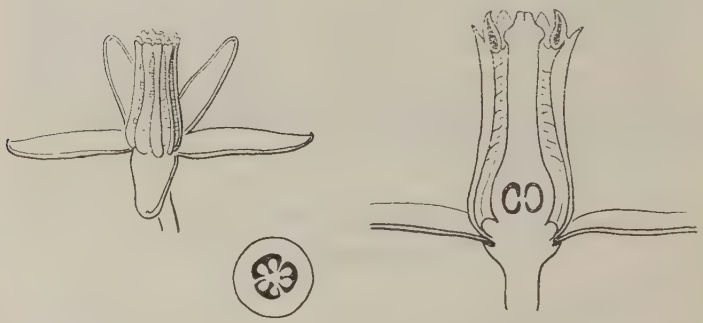
Melia

M. excelsa Jack.

Mal. Miscell. 1, *1820*, p. 12.

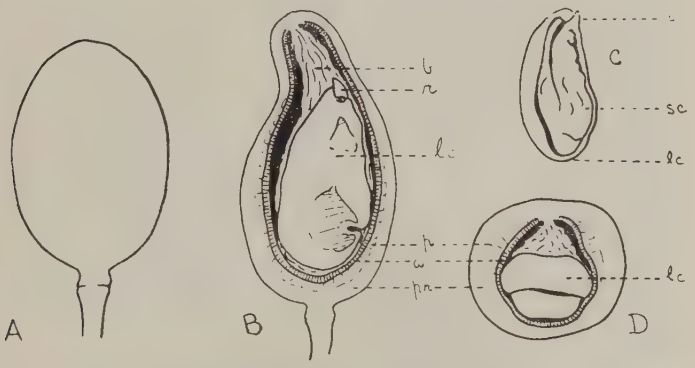
This noble tree has escaped the clutches of botanists for more than a century. It was described from living specimens collected in Penang, and has not been recognised since, though Griffith doubtfully referred to it specimens from Mergui (Not. 4, p. 499). The latest reference to it is in Ridley's Flora where it is excluded from Melia and referred to Chisocheton, though omitted from Chisocheton (Fl. Mal. Pen. 1, *1922*, p. 384). Other authors have referred the species to Melia on Jack's authority without comment.

In July 1936, I was studying trees in Penang and was attracted by several large specimens in and about the cemetery on Western Road and by one of the same kind in the Waterfall Gardens. Subsequently I identified the same species as a rather common village-tree throughout the country from Kedah and Kelantan to Malacca. To Malays it is well-known as Sentang, Setang or Setan, the timber being valued for house-building and the young shoots being eaten as a vegetable. Malays report that it occurs also in lowland forest, though scattered. I have not seen it wild myself but there is a specimen in the Singapore Herbarium from a wild tree on Penang Hill and Mr. C. F. Symington (Forest Research Officer, Kepong) has recently sent me wild specimens from Malacca. I collected flowers in Malacca in 1936, and fruits in Kelantan in 1937: there are also in the Singapore Herbarium several flowering specimens from the tree in the Waterfall Gardens at Penang, another from Bukit Erskine (Penang) and two collected by Alvins in Malacca. The 'Bukit Erskine specimen' was seen by King but not identified, and Alvins' specimens were referred by Ridley to *Chickrassia tabularis*. The specimens from the Waterfall Gardens have been referred to *Melia indica* and to *C. tabularis*.



Text-Fig. 1. *Melia excelsa:* flower, × 3: longitudinal section of the flower, × 6; transverse section of the ovary, × 6.

After studying the flowers and fruit, I find that this Sentang is a Melia closely allied with *M. indica* (= *M. azadirachta*) so that, if the genus Azadirachta is recognised, the Sentang will belong to it. The floral structure is identical with that of *M. indica* though the colour of the flower is different, but the numerous entire leaflets, the large panicles, the oblong fruits without a proper stone, the lobed or puckered cotyledons and the very scaly bark of large trunks abundantly distinguish it. The few ovules, large wingless seeds, and 1-seeded, indehiscent fruits forbid any reference to *Chickrassia.*



Text-Fig. 2. *Melia excelsa:* A, fruit; B, fruit in longitudinal section; D, fruit in transverse section; C, embryo: × 1½.

b, brown fibrous tissue; *lc,* large smooth cotyledon; *sc,* small wrinkled cotyledon; *r,* radicle; *pr,* pericarp; *p,* rather pulpy tissue of the pericarp; *w,* rather woody inner layer of the pericarp.

I read by chance the description of *Melia excelsa* in Jack's Miscellanies. I found that it corresponded exactly with the Sentang and I asked myself in vain what other tree in Penang could be both *Melia* and *excelsa.* Indeed, I cannot doubt that the big trees (100 feet or more in height) at the cemetery in Penang are the very ones which Jack described for they are certainly much more than a hundred years old.

In habit *M. excelsa* is like a gigantic *M. indica* with shaggy bark. It is also very like *Ailanthus malabaricus*, but can always be distinguished by the colour of the withering leaflets which turn red in the Ailanthus, yellow in the Melia: the bark of the Ailanthus seems also to remain smooth. That of the Melia is curious in changing from smooth to fissured and flaky not until the tree has reached a large size. The fruits of the Melia are interesting because they suggest an imperfect state of evolution: they have not the distinct pulp and stone of *M. indica* but a leathery-fleshy rind inseparable from a slightly sclerosed endocarp: a microscopic study of the developing fruit will be necessary to establish its detailed structure.

The question must now be raised whether *Chickrassia tabularis* really occurs in Malaya. The specimens so identified by Ridley are *M. excelsa* and such, on the evidence of the vernacular name Suntang, are the basis also of the Malayan record in Burkill's Dictionary (1935). King referred a specimen of Maingay's from Malacca to *C. tabularis:* I have not seen it but cannot but suspect it may also be *M. excelsa* for, superficially, the similarity is great.

It seems that *Azadirachta integrifoliola* Merr., from Palawan, is identical with *M. excelsa* (Philipp. Journ. Sci. 4, *1909* p. 272). I can find no difference in description. The tree may also be expected to grow therefore in North Borneo, Siam and Indo-China.

I append a description of *M. excelsa* drawn mainly from living material:—

> A tall evergreen tree, up to 50 m. high: *crown* rounded but rather open and uneven, the branches ascending obliquely and spreading but not drooping, the leaves tufted at the ends of the branches: *trunk* cylindric from the base or slightly buttressed over the main roots, massive in old trees: *bark in young trees* pinkish grey or pinkish brown and entire: *bark of large trees* (over 40 cm. diam. of trunk) pale brownish or greyish buff, longitudinally fissured and scaling in long, thin, rather fibrous, jagged, oblong, grey flakes generally breaking off at the upper end first and then curling out from both ends (hence the trunk and main branches fissured-flaky and rather shaggy): *twigs* massive, with big leaf-scars, scarcely grooved at the insertion of the leaf, *the pith pinkish but odourless: young leaves* pink: *old leaflets* withering bright yellow: *buds* pale green, *thinly encrusted with resin: young shoots puberulous, soon glabrous.*
>
> Leaf with 7–11 pairs of alternate or subopposite leaflets, the terminal leaflets generally absent, the leaflets reduced in size toward each end of the rachis: *rachis* 20–60 cm. long, with a pit on each side of the base, subterete, the leaflets jointed to it by very short petiolules 2 mm. long: *leaflets* 4–12.5 × 2–3.5 cm., *lanceolate-elliptic,* asymmetric, more or less curved, tapered

and subacute or subacuminate, the ends curled down, thin, *entire*, the edges rather undulate and slightly incurved on drying, *the base very unequal*, glabrous, drying fuscous on both surfaces, with 6–11 pairs of lateral veins curving forward and inarching faintly near the edge, the interstices laxly reticulate.

Panicles 20–45 cm. long, axillary, upright, puberulous, green, branched to the 5th or 6th degree, rather laxly, the lower branches 1–8 cm. long, *flowers sweetly scented: bracts* 1 mm. long or less, lanceolate, adpressed, very inconspicuous: *pedicels* 1–3 mm. long, puberulous: *sepals* 5, barely 1 mm. long, rounded or subacute, imbricate, slightly joined at the base, puberulous, the edges ciliolate, pale green: *petals* 5, 5–6.5 mm. long, 1.5–2.2 mm. wide, oblong-spathulate, blunt, often with a minute incurved mucro, spreading but not curled back, puberulous, pale cream white: *staminal tube* 4–4.5 mm. long, 2–2.5 mm. wide at the bottom, slightly ventricose, with 10 longitudinal striæ each ending in a short sub-bifid tooth at the top of the tube, the striæ showing as ridges in the dried flower, glabrous externally but with a few hairs in the upper half internally, pale cream white: *anthers* 10 (rarely 8 or 9), .8 mm. long, sessile, pointed, attached one at the base of each tooth of the staminal tube, slightly exsert, yellow: *ovary* 3-celled, each cell with 2 ovules, green, seated on a small, entire disc: *style* pale green, dilated into a small rim just below the 3 whitish, adpressed, blunt stigmatic lobes, the style breaking off the young fruit along with the staminal tube and leaving a small scar.

Fruit 2.4–3.2 × 1.3–1.6 cm., ellipsoid, often with a curious constriction near the blunt apex, glabrous, green then yellow when ripe, indehiscent: *rind* rather thick, rather leathery fleshy but with a little soft tissue inside, edible, containing a little white latex, the thin endocarp slightly sclerosed: *seed* large, solitary, green, with a thin, brownish, papery testa, exalbuminous, the cotyledons distinctly unequal and often rather lobed, puckered or pitted, the radicle shortly exsert, the seed giving a smell of garlic when bruised or cut.

Chickrassia

C. tabularis A. Juss.

(*see* the remarks under *Melia excelsa*).

Heynea

H. trijuga Roxb.

It is customary to refer to this species *H. quinquejuga* Roxb. and *H. sumatrana* Miq. as a variety *multijuga* DC. It is possible that this variety should be maintained as a distinct species because it has 4–6 pairs of leaflets with 8–13 pairs of lateral veins (3–4 pairs with 5–8 pairs of lateral veins in *H. trijuga*), slightly larger flowers, and slightly smaller fruits. However, the specimens of typical *H. trijuga* in the Singapore herbarium are too few for a decision.

LEGUMINOSAE

Adenanthera

Ridley and Burkill suggest that neither *A. pavonina* nor *A. bicolor* is indigenous to Malaya. The herbarium-specimens certainly do not suggest that they are forest-trees, but from having met with both repeatedly in the high forest from Singapore to Kedah and Kelantan I am convinced that they are indigenous to the country. Big trees of *A. bicolor* occur mostly in the inland virgin forest on small hills. *A. pavonina* prefers the coastal forest with *Eugenia grandis, Planchonella obovata* and *Parinarium corymbosum. A. bicolor* is common, for instance, in the forest round Kroh, Grik, on Penang Hill, and on Bukit Timah. *A. pavonina* occurs in all the virgin coastal forest of the East Coast, whether in sandy bays or on rocky headlands and islands.

Albizzia lebbek Benth.

Ridley and Burkill consider that this species is not wild in Malaya. This is certainly true of by far the greater part of the country, but I think that in the north of Kedah, in Perlis and, probably, in Lower Siam the species is one of the big trees of the virgin forest just as Parkia is throughout the Indo-malayan rain-forest. In the neighbourhood of Kodiang in Kedah, and northward to the Siamese border, there are so many, very large trees of *A. lebbek* in the virgin forest and but partly exploited bamboo-forest that one cannot doubt that they are indigenous. The species thus appears as a member of the Indo-Chinese-Burmese monsoon-flora which extends southward to the latitude of Penang.

Erythrina

E. fusca Lour.

Syn. *E. atrosanguinea* Ridley, Journ. Roy. As. Soc. Str. Br. 59, *1911*. p. 93.

Specimens of the three syntypes of *E. atrosanguinea* are at Singapore. They are exactly *E. fusca* as interpreted by modern authors.

E. indica Lam. and **E. variegata** L.

It has been proposed by Merrill that *E. variegata* should embrace *E. indica* which should be regarded as a variety of it (Interpr. Herb. Amb. *1917*, p. 276). It has yet to be shown, however, that *E. variegata* (based on Rumphius Herb. Amb. 2, t. 77) may not be *E. Parcellii* Hort. Bull. which, as Rock declares (Leguminous Plants of Hawaii

p. 187), is in many ways so distinct from *E. indica* that one cannot readily accept it as a variety. In this, I agree with Rock. What one must know before arriving at a final decision, is whether there is a Malaysian variety of *E. indica* with variegated leaves that is distinct from *E. Parcellii*. Until then, one cannot know how to apply the name *E. variegata*.

Inocarpus edulis Forst.

This plant is said to be a native of Eastern Malaysia (in its widest sense) and of the Pacific Islands. But I find that it is very common in parts of the virgin swampy forest in the East of Johore.

The Johore plants differ from the specimens of cultivated plants in the Singapore herbarium by having rather thinner, more pointed and distinctly ovate-lanceolate leaves with slightly laxer reticulation: their fruits, also, may be a little more oblong. But these are trivial points and may well be covered by the normal variation of the species in cultivation or, rather, they may be the expression of the habitat of the Johore plants. These grow in the mildly brackish, tidal swampy forest round the Sedili Rivers from near the sea to some ten miles inland. They are straggling bushes or small trees reaching 30 feet high and, generally, they have the appearance of having been coppiced because several stems commonly arise from the same trunk which may reach 8" in diameter: they are not coppiced, however. In many places along the Sedili River, particularly just behind the wild Nipa-palms, the plants of Inocarpus form almost pure stands as the commonest undergrowth tree beneath the dominant forest trees. Their habitat is therefore damp but, though the roots must be immersed almost continuously in water, they do not appear to have pneumatophores. The inner bark of the trunk has blood red lines from which a red sap issues. The flowers have a faint sour fragrance, and the petals are yellowish white. The trees are known to local Malays as "Kopit" or "Kerepit". The Malays eat the roasted seeds of the wild fruits but make no efforts to cultivate the plants.

I have studied these plants in Johore on several occasions in the last four years and I am convinced that they are wild. Certainly, I have never seen such large trees (10 m. high) as Brown has recorded from the Marquesas Islands (Bernice P. Bishop Museum, Bull. 130, *1935*, p. 118) but I do not find that his measurements agree with the opinions of other botanists who describe the Inocarpus as a smallish and slow-growing tree. If these plants are not

wild in the virgin forest of E. Johore, the question then arises who put them there. *I. edulis* is almost, or quite, unknown in other Malayan villages and no specimens have been collected from other parts of the Malayan forest. The East of Johore seems to have been virgin territory until the last century, when a few small fishing villages arose and the Chinese began to cultivate some of the low hills for pepper, gambier and, most recently, rubber. If one contends, therefore, that the Inocarpus was introduced into the East of Johore one must suppose that this 'rare' plant was brought during the ordinary process of opening up of virgin country in Malaya, that it is no longer cultivated but has escaped into the forest and that, in spite of its slow growth, it has reproduced itself in thousands so as to become one of the characteristic small trees of the undergrowth in the high forest. I consider this hypothesis so improbable that I am bound to propose the alternative that *I. edulis* is a natural member of the brackish swampy-forest of E. Johore and, probably, Borneo. This means either that *I. edulis* has a very wide natural distribution from Malaya to South East Polynesia or, as suggested by Guppy in 1906 (Observations of a Naturalist in the Pacific, Vol. II, p. 421) and as I believe myself, that it was carried from Western Malaysia to the Pacific by primeval men in their eastward exploration. If so, one may wonder that it is so restricted in Malaya because it is unlikely that it occurs on the West coast. But our ignorance of the distribution of plants through the Malay Archipelago is too great to allow of satisfactory theorising.

The Malayan collections are these:—

SFN 28640 (Jason Bay, Johore), SFN 34704 (Sedili River, Johore): Corner s.n., 19.10.37 (Sedili River, Johore).

Millettia

M. atropurpurea Benth.

Pl. Jungh. *1851–5*, p. 249.

Synonyms:—

Adinobotrys atropurpureus (Benth.) Dunn, Kew Bull. *1911* p. 197.

Whitfordiodendron atropurpureum (Benth.) Dunn, Kew Bull. *1912* p. 364.

Padebruggea atropurpurea (Benth.) Craib, Kew Bull. *1927* p. 61.

P. pubescens Craib. Kew Bull. *1927*, p. 61.

W. pubescens (Craib) Burkill, Dict. Ec. Prod. Mal. Pen. *1935*.

This common, though anomalous, Malayan tree has wandered through several genera until it has found a temporary resting place in Whitfordiodendron. I now restore it to Millettia.

It has been generally accepted by those who have considered the species that it has indehiscent fruits and 1–2(–3) ovules in the ovary, and that by these two characters it must be referred to Whitfordiodendron or Padebruggea in contrast with Millettia which has dehiscent pods and several to many ovules in the ovary. But I find that the Malayan trees have 2–5, generally 3–4 ovules in the ovary and that the pods are normally, if tardily, dehiscent along both sutures. Generally, only 1–2 ovules develop into seeds but 3– or 4– seeded pods are not uncommon: a 5-seeded pod I have not seen. The pods do not dehisce until they have fallen from the tree. Then, as they dry on the ground, they split along the whole of one suture and most or all of the other so that finally the valves may separate completely: the seeds roll out, and never sprout in the pod. In these two points, therefore, the species is a Millettia. The climbers, *M. cinerea* and *M. pachycarpa*, moreover, have evidently the same kind of large, leathery, slowly dehiscent pod with large plump seeds.

It is given, also, that the ovary of Millettia is more or less sessile whereas that of Whitfordiodendron and Padebruggea is stalked. But I do not find this character absolute. The ovary is shortly stalked in nearly all the Malayan species of Millettia so that the longer stalk of *M. atropurpurea* is merely a quantitative difference.

I think that the distinctions between the three genera Millettia, Whitfordiodendron and Padebruggea are artificial and ill-defined so that they had better be reduced together. *M. atropurpurea* combines the characters of all three and, as a tree, it seems more nearly related with *M. albiflora* than with any other Malayan species.

Craib has distinguished *Padebruggea pubescens* from *P. atropurpurea* by the pubescent calyx of the former. He has related the character with a distinction in geographical distribution, but the region from which the collections studied by him were derived is so little known even geographically that no botanical significance can yet be accorded to the observation. Moreover, the separation of two species on this character of the calyx, which is only varietal, means that sterile and fruiting trees cannot be identified. To the field-botanist, such "splitting" is ridiculous. One might as well make species for the different markings on the seeds: some trees have striped seeds, others wholly black or wholly brown seeds: but, fortunately, this variation is barely noticeable in the herbarium.

Saraca

S. palembanica (Miq.) Baker.

Syn. *S. triandra* Baker F.B.I. II. p. 272.

I can find no constant way of distinguishing *S. triandra* from *S. palembanica*, the inflorescences, flowers, fruits and leaflets of which are identical. *S. triandra* is said to have 2–4 pairs of leaflets and *S. palembanica* 4–7 pairs. Trees with 1–2 pairs, 2–3 pairs, 3–5 pairs and 5–7 pairs can all be found, so that the distinction has no value.

S. palembanica varies considerably also in the intensity of the reddening of the calyx and of the fragrance of the flower. In some trees, too, the inflorences are mostly on the twigs and branches behind the leaves: in others, which generally have few pairs of leaflets, they are mostly terminal or axillary on the leafy twigs.

LYTHRACEAE

Lagerstrœmia

L. flos-reginæ Retz.

This name is generally regarded as a synonym of *L. speciosa* (L.) Pers. but King pointed out that the identity of *L. speciosa* had not been established so that it was impossible to reduce another species to it (Fl. Mal. Pen. 3, p. 353). I do not find that the problem has been solved and, therefore, I consider that Retzius' name is the correct one.

L. macrocarpa Wall.

There is no evidence that this species occurs in Malaya. The two collections referred by Ridley to *L. macrocarpa* (Fl. Mal. Pen. 1, p. 824) are merely *L. flos-reginae*. There are duplicates in the Singapore herbarium and neither has the characters of *L. macrocarpa* as understood by King (Mat. Fl. Mal. Pen. 3, p. 353).

MYRTACEAE

Rhodamnia trinervia (Sm.) Bl.

In referring to this species *Myrtus triinervia* Lour., Merrill has omitted to mention Loureiro's diagnostic character "racemis longis" which is repeated in the description (Trans. Am. Phil. Soc. XXIV pt. II, *1935*, p. 283). It is difficult to see how the character can apply to *R. trinervia*. Incidentally, there is no reason to take Loureiro's spelling of "triinervia" as an error because it is not listed in Loureiro's own 'Errata'. I consider Loureiro's species as yet doubtful.

Tristania

T. obovata Benn.

Pl. Jav. Rav. *1838*, p. 127, t. 27.

Synonym:—

T. spathulata Ridley, Journ. R. As. Soc. Str. Br. 82, *1920*, p. 184. Fl. Mal. Pen. 1, p. 715.

In describing his collection (5886) from Batam Island as *T. spathulata*, Ridley was mistaken about *T. obovata* which he stated to be "a Bornean plant, a big tree with much thinner and larger leaves and much smaller fruit, the leaves quite a different shape". As described by Bennett, *T. obovata* is a maritime, twisted tree with small, spathulate leaves from the island of Banca. Ridley's collection, of which there is a specimen at Singapore, is specifically identical with *T. obovata* as described and illustrated by Bennett. It agrees also with specimens from neighbouring Dutch islands identified as *T. obovata* at Buitenzorg.

I find that *T. obovata* is a common, twisted tree of laterite sea-coasts, headlands and islands round Singapore and on the East Coast of Johore as far north as Mersing. I have not seen it on the West Coast or on the coast of Pahang. It seems, therefore, a plant dispersed from the Rhio Archipelago.

APOCYNACEAE

Cerbera

How backward is botany in Tropical Asia, this genus will illustrate. Hooker, Clarke, Pitard, Merrill, Alston and Burkill consider that all the common trees of Cerbera from India to the Moluccas represent one species, *C. odollam* Gærtn. Against their opinion, that of Gærtner (1791), Valeton (1895) and Ridley (1923) has had no avail though these authors are the only ones who have published their arguments. How one species of plant could be so dimorphic in flower and fruit, as the union of Valeton's two descriptions would imply, was beyond my understanding. During the last few years I therefore studied the wild trees in Malaya, of which I saw several hundred, and I found that two species occurred, almost exactly as defined by Valeton, with never an intermediate. To Valeton's morphological differences, I add also one of habitat. Valeton and Ridley called the species *C. odollam* Gærtn. and *C. lactaria* Ham., disregarding *C. manghas* L. as a *mixtum compositum;* but, on reference to the Linnean description and to Gærtner's evaluation of it, I find that *C. lactaria* must be called *C. manghas*. My argument is this.

C. manghas L. em. Gærtner, De Fruct. II. *1791*, p. 192.

Syn. *C. lactaria* Ham. apud DC. Prodr. VIII, *1844*, p. 353 (*See* Valeton, An. Jard. Bot. Buit. XII, *1895*, p. 238). *C. odollam* sensu auctt.

Corolla tube cylindric, much longer than the petals, 2.5–4 cm. long.

Corolla-limb 2.5–5 cm. wide, *with a red eye,* of a lesser width than the length of the corolla-tube or slightly exceeding it.

Stamens attached near the top of the corolla-tube.

Fruit often twinned, oblong or ovoid, pointed, 5–7 cm. long, 3.6–4 cm. wide in the greater diameter, 3.4–3.8 cm. in the lesser, slightly flattened.

Seed-cavity much compressed, with one seed.

Habitat: sandy or rocky sea-coasts.

Distr. Malaya, Siam and Java eastward to New Guinea.

C. odollam Gærtn. De Fruct. II. *1791*, p. 193.

(*see* Valeton, Ann. Jard. Bot. Buit. XII. *1895*, p. 238). Syn. *C. manghas* sensu auctt., non sensu L.et Gærtn.

Corolla-tube swollen in the middle, shorter than the petals, 1.2–2 cm. long.

Corolla-limb 5–7.5 cm. wide, *with yellow eye,* always of much greater width than the length of the corolla-tube.

Stamens attached in the middle of the length of the corolla-tube.

Fruit always solitary, much larger, as wide as long, blunt, compressed but round when viewed at right angles to the plane of the long diameter, 6–8 cm. long and wide in the long diameter, 5–7 cm. wide in the short diameter.

Seed-cavity subrotund, 1–2 seeded.

Habitat: tidal river-banks in the mangrove and fresh-water forest.

Distr. from Indo-China, Siam, Malaya, Java westward to Ceylon.

It seems that only in Siam, Malaya, Java and, perhaps, Sumatra and Borneo does the distribution of the species overlap. Valeton thought it possible that the species differed in the colour of the fruit but I find that in both the fruit ripens from green, with fine whitish spots, through yellow to rose-red, purple and, at last, black. In Malaya, the difference in habitat I find most constant on both coasts: *C. manghas* accompanies the Terminalia-Barringtonia formation though extending into the Eugenia-forest which developes behind on sandy shores, while *C. odollam* belongs to the true Mangrove or Rhizophora-Nipa formation, though

extending into the fresh water formation of *Tristania sumatrana—Pandanus helicopus*. Both occur wild on Singapore island. *But, as Valeton remarked, it is impossible to distinguish the species from leaf-characters.*

As regards the original description of *C. manghas* L. (Sp. Pl., *1753*, p. 208), it offers one of those, unfortunately too few, cases in which Linnæus gave a long, detailed description in addition to the diagnosis and citation of previous authors. From the following extracts of the description, there can be no doubt of the species as intended by Linnæus in the book which marks the beginning of nomenclatural botany:—

> "Corolla .... lobis ovatis, tubo brevioribus. Stam ..... tubi superiore parti inserta ..... Stylus ... tubo fere brevior ..... Drupa ovata, magnitudine ovi anseris....."

These are the diagnostic floral characters of *C. manghas*, as I have described it above, in contrast with *C. odollam*. The Linnean description was evidently based on a specimen of Osbeck's from Java, for the word *"Osbeck"* concludes the description.

The reason which has been advanced for rejecting *C. manghas* L. as a *mixtum compositum* is that the Linnæan reference to "Manghas lactescens" of Burman's Flora Zeylanica covers also *Tabernaemontana dichotoma*. Thwaites showed in his Flora of Ceylon, that the picture of "Manghas lactescens" was a Cerbera but that some of the specimens, at least, were Tabernæmontana. Moreover, the reference by Linnæus to "Odollam" of Rheede certainly introduces *Cerbera odollam*. But, as these references are to pre-Linnean literature, I do not see how they can be used against the very clear Linnean description in typifying *C. manghas*. Besides, if *C. manghas* is held to be a *mixtum compositum*, it is equally important to realise that Gærtner was the first to have resolved it by describing anew *C. manghas* and distinguishing *C. odollam*, with remarkable perspicacity, and that the correctness of Gærtner's species has been proved by Valeton.

It may be remarked that "Arbor lactaria" of Rumphius Herb. Amb. II, 243, t. 81, is *C. manghas*: the red eye is described.

Nerium indicum Mill. Gard. Dict. ed. VIII, 1768, n. 2.
Merrill Fl. Manila 1912, 373: Sp. Blancoanæ 1918, 13: Enum. Phil. Pl. III, 1923, 336.
Synonyms:—
N. latifolium Miller loc. cit. no. 3.
N. odorum Solander in Ait. Hort. Kew I, 1789, 297.

The usual name for this plant is *N. odorum* but, as it is universally admitted that *N. indicum* and *N. latifolium* are synonymous with it, they have priority. Both Miller's names were simultaneously published. Merrill has chosen *N. indicum* for the species and therefore *N. latifolium* must be made the synonym.

Tabernæmontana

I agree with Merrill's remarks on the unsatisfactory separation of Ervatamia from Tabernæmontana and also with his conclusion that *T. divaricata* (L) R. Br. is the correct name for *Ervatamia coronaria* (Jacqu.) Stapf. (Contrib. Arn. Arb. VIII, *1934*, p. 141–143).

LAURACEAE

Cinnamomum

C. Deschampsii Gamble Kew Bull. *1910* p. 219.

According to the original description this species differs from *C. zeylanicum* only in the rather thinner, blunt, elliptic leaves. I find that these characters vary so much in the trees in Malaya that so far as concerns the leaves, they offer no reliable distinction. The structure of the flowers is identical in both species. I have dissected fresh flowers of both, as well as dried specimens. But *C. Deschampsii* differs from *C. zeylanicum* in the size and grouping of the flowers and in the shape of the fruiting calyx. As these points are trivial, and *C. Deschampsii* in other morphological respects is identical with *C. zeylanicum* and has the same strong cinnamon smell in leaves, twigs and bark, I reduce *C. Deschampsii* to *C. zeylanicum* as follows.

C. zeylanicum var. **Deschampsii** (Gamble) var. nov.
= *C. Deschampsii* Gamble Kew Bull. *1910* p. 219.
differs from *C. zeylanicum* typicum in the following points:—

leaves generally blunt or retuse: *flowers* smaller, perianth 3–4 mm. long (4–5 mm. in *C. zeylanicum*), on shorter pedicels 1–3 mm. long (2–5 mm. in *C. zeylanicum*), in trichasia generally condensed to groups of 7 (distinct trichasia in *C. zeylanicum*): *fruiting calyx*, in the living state, grooved slightly at the base of the perianth-lobes, elsewhere even, in the dry state

indistinctly or irregularly ridged (with ca. 12 distinct, strong, longitudinal ridges in the living and dried state in *C. zeylanicum*).
MALAYA: Penang, Kuala Lumpur, Singapore in gardens and by roads; ? origin.

On Fraser's Hill, Pahang, grow many large trees in the forest which from the leaves I would say must be *C. zeylanicum* or this var. *Deschampsii* for they have identical size, shape, venation and texture. Unfortunately I have not been able to collect fertile material (SFN 33199).

It may be noted that the so-called glands at the sides of the 3rd row of the stamens in *C. zeylanicum* and var. *Deschampsii* have stalks and yellow sagittate heads exactly like the staminodes of the 4th row so that the 'glands' appear to be staminodes and to suggest the presence of yet two more whorls of stamens c.f. Gamble's note to Cryptocarya (Mat. Flor. Mal. Pen. V. p. 37).

Lindera

L. lucida (Bl.) Bœrl.

Handl. Fl. Nederl. 3, *1900*, p. 147.
Basinym: *Litsea lucida* Bl., Bijdr. *1826*, p. 961.
Synonym: *Lindera malaccensis* Hook., F.B.I. 5, *1886*, p 183.
Lindera selangorensis Ridley, Journ. F.M.S. Mus. 5, *1913*, p. 44.

Following the extended description of *Lindera lucida* given by Koorders and Valeton (Bijdr. Booms. Java. 10, p. 238) and their illustration (Baumart. Java t. 220), there can be no doubt of the correctness of Gamble's surmise that *L. malaccensis* should be a synonym (Mat. Fl. Mal. Pen. 5, p. 196). Hence I follow Merrill's reduction (Pl. Elmer. Born. p. 90). I can detect no difference between the descriptions of the two species.

In the Singapore Herbarium there are 3 sheets, evidently syntypes, of *L. selangorensis* Ridley, namely H. C. Robinson's from Gunong Mengkuang 6.2.13 (2 sheets), and Ridley's from Sempang Mines April 1911 (1 sheet). I cannot find any difference between these and *L. malaccensis*. Ridley says that *L. selangorensis* differs in its thinner leaves, glaucous beneath, oblong rounded petals and longer "racemes" (*i.e.* the common stalks to which the peduncles of the umbels are attached). But all these points are most variable. *L. malaccensis* has thick or thin leaves and its "racemes" vary from 1–14 mm. long: the petals seem to offer no difference. Hence there remains as distinctive of *L. selangorensis* only the glaucous underside of the leaf and I doubt if this can be considered proven because there is

no field-note to the point and it is impossible to decide from a dried and poisoned specimen. In Singapore, *L. malaccensis* generally has the leaves not glaucous but I have seen a few plants with slightly glaucous leaves. At most therefore, *L. selangorensis* can be a glaucous-leafed variety of *L. lucida.*

Phœbe

P. grandis (Nees) Merrill (=*P. opaca* Bl.) and **P. cuneata** Bl.

All the Malayan collections which have been referred to *P. opaca* and *P. cuneata* by Gamble and Ridley and by subsequent determinations are really a single species which is *P. opaca* Bl. sensu Koorders and Valeton (Bijdr. Booms. Java X, *1904,* p. 90) and sensu Koorders (Exc. Flora von Java, II, p. 265). But the correct name of *P. opaca* is *P. grandis,* derived from *Alseodaphne? grandis* Nees, as Merrill has shown on Gamble's evidence (Contr. Arn. Arb. VIII. *1934,* p. 61). I have dissected the flowers of all the collections in the Singapore Herbarium and find their structure to be identical: nor is there any difference in Gamble's descriptions of the flowers of the two species (Mat. Flor. Mal. Pen. V, p. 109). The other distinctions given by Gamble do not hold. The shape and texture of the leaf vary considerably and are not correlated with definite variations of the inflorescence or flowers. The tawny pubescence on the perianth of *P. grandis* and the grey tomentum on that of *P. cuneata,* which Gamble gives as diagnostic, are impossible to distinguish and the colour is an after effect of drying: the living plants have white hairs. Likewise the length of the panicle is no constant feature and Gamble misunderstood the fruiting specimen of *"P. cuneata"* which he examined because the panicle does not elongate in fruit. The flowers and undersides of the leaves are very shortly hairy, especially when young: mature leaf-blades are finely puberulous, glabrescent or even glabrous beneath, for which reason I conclude that the Malayan species cannot be *P. cuneata* Bl. sensu Koorders & Valeton (op. cit.). These authors say that *P. cuneata* is not known for certain except from the mountain Salak, near Buitenzorg.

The Malayan specimens vary appreciably in size, shape, texture and hairiness of leaf, in details of venation, especially the prominence of the veins near the edge of the leaf-blade, and in the glaucousness of the underside of the blade: typically the blade is bluish-white beneath but some trees have only subglaucous leaves. These differences are so variously combined that it is not possible to detect any constant varieties in the material yet collected.

FAGACEAE

Quercus lappacea Roxb. Fl. Ind. III, 637.
G. King Ann. R. Bot. Gdns. Calc. II p. 41 t. 33.
Synonyms:—
Pasania lappacea (Roxb.) Gamble Mat. Fl. Mal. Pen. V (p. 416).
Quercus Wrayii King loc. cit. p. 77 t. 104.
Pasania Wrayii (King) Gamble loc. cit. p. 446.
Collections of *Q. lappacea* examined:—
INDIA: Gallatly 388 (Khasia Hills).
MALAYA:—Perak: Scortechini s.n., King's Collector 3919. Negri Sembilan: C.F. 707.
Collections of *Q. Wrayii* examined:—
KEDAH: C.F. 17590, 17593.
PENANG: Curtis (May 1890) s.n.
PERAK: Wray 2854 (Kota) type-collection (4 sheets at Singapore).
PAHANG: Ridley 13727, Henderson s.n. 22.4.30 (Cameron Highlands).

Strangely enough, neither King nor Gamble remarked even the likeness of *Q. lappacea* and *Q. Wrayii* but separated them widely each in a different subgenus. In *Q. Wrayii* the cupule covers the nut entirely, though the type-collection has only immature fruits from which the final shape of the cupule cannot be judged with certainty. In *Q. lappacea* the cupule leaves one half or two-thirds of the nut uncovered, though it seems that in some Indian specimens it is little more than a disc at the base of the nut, c.f. Wight Ic. t. 220, Hook. Ic. Pl. t. 224 (*Q. Mackiana* = *Q. lappacea*). In hairiness, leaf-shape, short petiole, venation, male spikes and flowers, size, thickness and stout uncinately tipped processes of the cupule and size, colour, hairiness, shape and thickness of the nut, the specimens which are cited above are identical. They differ only the development of the cupule; this feature the specimens in the Singapore Herbarium show to be variable. In the specimens identified as *Q. Wrayii*, the cupule entirely covers the mature nut but in C.F. 17593 the cupule leaves a considerable gap at the apex through which the nut can be seen. Of the specimens cited as *Q. lappacea*, that of Scortechini has mature fruits which are covered wholly, or only two-thirds, by the cupule and this collection is identified by King and Gamble as *Q. lappacea:* that of C.F. 707 has nuts which are probably not quite ripe but which are most instructive for some are wholly covered by the cupule, others of equal size are covered for 4/5, 3/4, 2/3, 1/2, and 1/3 of the length by the cupule. I consider that this collection proves that *Q. lappacea* is a species in which the size of the cupule varies exactly as in *Q. encleisacarpa* and its variety *aperta*. One might regard *Q. Wrayii* as a Malayan variety of *Q. lappacea* but more collections are really needed for satisfaction. Kurz (For. Fl. Burma, II p.

484) says that the nut of *Q. lappacea* is covered "1/2 or 1/3 way up" by the cupule. Actually, we need more information on the Indian trees before it can be decided if the cupule is invariably short in them.

Q. lappacea and *Q. encleisacarpa* show how artificial are the subgenera into which Quercus has been divided and which are often raised, nowadays, to generic rank. Both species transgress the limits of their respective subgenera. Indeed, these subgenera, or genera, are artificial levels of classification to which species have attained independently in the evolution of their acorns, very much as families like the Compositæ, Dipsacaceæ, Rubiaceæ, Euphorbiaceæ, Pandanaceæ, or Bromeliaceæ have arrived independently at the capitulum. A thorough morphological study of oaks will certainly reveal a very different classification of the species based on natural affinities, and one not ignoring the possibility of homoplasy.

URTICACEAE

Artocarpus

A. incisus (Thunb.) Linn. f.

Suppl. *1781*, p. 411.

Basinym: *Rademachia incisa* Thunb., Vet. Akad. Handl. Stokh. 37, *1776*, p. 254.

Synonym: *Artocarpus communis* Forst., Char. Gen., *1776*, p. 101.

What is the correct botanical name for the Bread-fruit? It used to be *A. incisus* until, a few years ago, the name *A. communis* was re-instated by Merrill (Interpr. Rumph. Herb. Amb. *1917*, p. 190). *A. communis* is now gaining favour.

The two genera, Artocarpus and Rademachia, were published in the same year, 1776, and there is no more precise date to indicate which name was published first. (The date of Forster's preface is Nov. 1775: the date of Thunberg's manuscript is 15th June 1775: but manuscript dates are not counted in the rule of priority). Thus the Bread-fruit was christened simultaneously *Artocarpus communis* and *Rademachia incisa*. The correct name for the Bread-fruit must therefore be decided according to Art. 56 of the International Rules of Botanical Nomenclature, 1935. In this Article, it is prescribed that one must use the name selected by the first author who clearly chose one of the equivalent and simultaneous names and reduced the others as synonyms. In the case of the Bread-fruit, the first author

was Linnæus f. who, in 1781, used the generic name Artocarpus in preference to Rademachia and the specific epithet "incisa" in preference to "communis". One must therefore follow Linnæus f. and call the Bread-fruit *A. incisus.*

Now, a possible flaw in this argument is that Linnæus f. did not actually cite Rademachia as a synonym of Artocarpus or *A. communis* as a synonym of *A. incisa.* It may be countered, therefore, that Linnæus f. did not actually *choose* between the simultaneous names. But when one considers that nomenclatural procedure in the 18th century was not so precise by a long way as that in the 20th century, and when one reflects on the details of Linnæus f.'s "choice", it is impossible to deny that he did not exercise a very careful judgement in the selection of the botanical names of the Bread-fruit and the Chempedak. He was faced with choosing a suitable generic name and, at the same time, suitable specific epithets for both the Bread-fruit and the Chempedak because Thunberg had described both *R. incisa* and *R. integra* under his new genus Rademachia. Obviously Artocarpus was a better name than Rademachia for the genus, and "incisa" a better epithet than "communis" for the Bread-fruit because it contrasted with "integra" for the Chempedak: both Bread-fruit and Chempedak are "communis". Under *A. incisus,* Linnæus f. cited *R. incisa* and under *A. integrifolia* he cited *R. integra,* so one cannot say that Linnæus f. did not consider Thunberg's names at the same time as Forster's. Indeed, I submit that Linnæus f. skilfully divided the honours between Forster and Thunberg.

A misgiving, which may arise in accepting the binomial *A. incisus* in preference for *A. communis,* is that the choice of Artocarpus in place of Rademachia should imply the acceptance of *A. communis,* because it was the original specific epithet under Artocarpus. But there is no such obligation in the Rules. Art. 56 gives the author who first unites the groups the right of choosing one name or, in the case of species, one epithet from the simultaneously equivalent names and it does not prescribe any rules of choice. In fact, it is clear that the intention is not to fetter the author's choice so that he can be free to select what to him seems the better name in consideration of etymology, typification, plant-geography, and so on. To the Article, however, there are the three Recommendations, XXXIII–XXXV, to assist the author in making his choice. Of these, Recommendation XXXIII concerns the present case. The Recommendation embodies three suggestions. In choosing Artocarpus, Linnæus f. acted contrary to the first and second suggestions, which imply that Rademachia should have been chosen in place of Artocarpus, but he could not have known that: on

the other hand it can be argued that he fulfilled the third suggestion. To choose *A. communis* is to act contrary to all three suggestions, which were evidently designed to meet all such problems.

Finally, it may be pointed out that Forster himself used the binomial *A. incisus* in his subsequent writings.

I am unable to discover, therefore, any legitimate reason for reviving the defunct *A. communis*.

A. dadah Miq. Fl. Ind. Bat. Suppl. I. *1862*, p. 420.

All the Malayan collections which have been identified as *A. lakoocha* Roxb. are *A. dadah*, which is certainly a distinct species from *A. lakoocha*. Mr. C. E. C. Fischer has kindly confirmed this conclusion for me by examining the specimens of both species at Kew. *A. dadah* is evidently a species of the Sunda-shelf, whereas *A. lakoocha* is a species of the Indo-Burmese monsoon-flora. *A. lakoocha* has oblong or globular, yellow male inflorescences with very short peduncles and lobed, areolate yellow fruits. *A. dadah* has smaller, pulvinate or mushroom-shaped, green male inflorescences with slender, longer central stalks and green, scarcely areolate fruits with pink flesh. The shape and venation of the leaf is also different in the two species. It seems that the twigs of *A. lakoocha* have colourless hairs: those of *A. dadah* are more or less brown, even blackish brown, in both living and dried states.

A. lakoocha must therefore be removed from the Malayan flora and the economic information concerning the Malayan "*A. lakoocha*" must be transferred to *A. dadah*.

Artocarpus Kemando and **A. Maingayi**

These species were united by Beccari (Webbia 5, 1923, 554). His opinion has been followed by Burkill and Merrill. But, from a study of the specimens from Malaya and Sumatra, that are in the Singapore Herbarium, I conclude that there is not satisfactory evidence for the reduction. Though the species are certainly close and in some cases their sterile twigs seem identical, yet the inflorescences and fruit-heads are readily distinguished. These are the obvious differences:—

A. kemando Miq.

All parts, excluding the peduncles and stipules, slightly hairy with short sparse hairs, soon glabrescent:

Leaf-blade always pointed or shortly accuminate.

Inflorescences and fruits slightly smaller than in *A. Maingayi* but with longer, hairier peduncles.

Male heads 1.5–4.5 cm. × .5–.6 cm.; peduncles .4–1.2 × .15 cm. hispid with *patent hairs* 1 mm. long (brown in dried specimens).

Fruit heads up to 3.5 × 1.8 cm., faintly marked into hexagonal areas but soon villous or felted with hairs obscuring the areolation: peduncles 1.5–3 cm. × .25 cm., hispid like the male peduncles.

A. Maingayi King.

Twigs, petioles and undersides of main veins of the leaf rather thickly hairy with persistent adpressed stiff hairs. *Leaf-blade generally obovate, blunt often retuse,* occasionally elliptic and subacute.

Male heads 3–6 × .6 cm. *with finely velutinate, short peduncles* .2–.5 × .15–.2 cm.

Fruit heads up to 5 × 2.5 cm., the hexagonal areolation always conspicuous in the developing fruit, only finely hairy: peduncles .3–1.2 cm. × .2–.3 cm., merely finely velutinate like the male peduncles.

A. peduncularis Kurz and **A. Lowii** King.

It has been suggested that these two species may be the same (Burkill's Dictionary, 1935). However, this view is certainly mistaken. The species are readily distinguishable from the leaf. *A. peduncularis* has elliptic or ovate-elliptic leaves with rounded, subcordate or abruptly cuneate base and 5–8 pairs of primary lateral veins. *A. Lowii* has larger lanceolate-elliptic leaves, gradually tapered to base and apex, and has 10–17 pairs of primary lateral veins. While *A. Lowii* appears to be widely distributed in Malaya, *A. peduncularis* seems to be restricted to the lowland swampy forest of Perak and Selangor. Most of the Malayan collections identified as *A. peduncularis* are *A. Lowii* and, thus, economic information concerning them has become confused. "Bengku" and "Siampa" are the local Malay names for *A. peduncularis*. *A. Lowii* is always called "Miku".

Ficus

F. caulocarpa (Miq.) Miq. Ann. Mus. Lugd. Bot. III, *1867*, 268.

non *F. caulocarpa* Miq., loc. cit. 235 and 297.
F. Vill. Novis App. *1880*, 199.
O. Beccari, Nelle For. Born. *1902*, 525.
E. D. Merrill Philipp. Journ. Sci. I, *1906*, Suppl. 46.
A. D. E. Elmer Leafl. Philipp. Botany I, *1907*, 244 (excl. syn. *F. caulocarpa* Miq. in Ann. Mus. Lugd. Bot. 3: 235 and 297).

Basinym:—
Urostigma caulocarpum Miq. Lond. Journ. Bot. VI, *1847*, 568.

Synonym:—
F. stipulosa (Miq.) Miq. Ann. Mus. Lugd. Bot. III, *1867*, 287. (basinym *Urostigma stipulosum* Miq. Lond. Journ. Bot. VI, *1847* 567). *fide* G. King, Ann. R. B. Gard. Calc. I, *1887*, 64 and II 1888, 184: E. D. Merrill Philipp. Journ. Sci. III C, *1908*, 402: En. Philipp. Pl. II, *1923*, 65.

F. infectoria Roxb. var. *caulocarpa* King Ann. R. Bot. Gard. Calc. I 1887, 63: Koord. & Val. Bijdr. Boomsoorti Java 11, *1906*, 138.

? F. timorensis (Miq.) Miq. Ann. Mus. Lugd. Bot. III, *1867*, 286 (basinym: *Urostigma timorense* Miq. Lond. Journ. Bot. VI *1847*, 569). *fide* G. King, Ann. R. Bot. Gard. Calc. I, *1887*, 63 and II *1888*, 185.

The nomenclature of this species is complicated because Miquel published simultaneously the homonym, *F. caulocarpa* Miq., for a species of Covellia (vide infra *F. Miquelii*). There are now two solutions to the problem, namely that of King, which has been followed by most botanists, and that of Merrill. After considering the matter as fully as possible, I decide that King's solution is correct.

King retained the binomial *F. caulocarpa* for the species of Urostigma, because it was a new combination for the earlier *Urostigma caulocarpum*, and for the species of Covellia which Miquel simultaneously published as *F. caulocarpa*, he proposed the new name *F. Miquelii*. He made *F. caulocarpa* (Urostigma) a variety of *F. infectoria* and reduced to it the simultaneous binomial *Urostigma stipulosum* Miq., and, doubtfully, *U. timorense* Miq. Subsequent botanists, namely Beccari, Merrill (1906) and Elmer, have considered *F. caulocarpa* (Urostigma) specifically distinct from *F. infectoria* Roxb. and with this opinion, I agree. Admittedly, there is a large group of species, or varieties, in the affinity of *F. infectoria*, *F. superba* and *F. glabella* which some may consider varieties and others as species, but a more detailed analysis of the flowers and receptacles is needed to determine their relationship than has yet been given. My own investigations suggest that *F. caulocarpa* (Urostigma) is nearer to *F. glabella* and *F. superba* than to *F. infectoria* and therefore I retain it, temporarily at least, as a species: it seems that Koorders and Valeton also had this opinion.

Merrill at first followed King's procedure but, later, and for no evident reason, preferred the binomial *F. caulocarpa* for Miquel's Covellia. Miquel's Urostigma, he therefore called *F. stipulosa* and *F. Miquelii* King he reduced to *F. caulocarpa* Miq. I think Merrill overlooked the fact that Miquel also made the new combination *F. caulocarpa* for *U. caulocarpa* Miq. in the same volume as that in which he published the Covellia, *F. caulocarpa*. Although the Covellia is described thirty odd pages before the same binomial appears for the Urostigma, and in a different chapter, there is nothing to show that their publication was not simultaneous. As no account is taken of page-priority, it is evident that the binomial must stand for the Urostigma, and that we follow King's procedure.

It may be argued (1) that King did not state satisfactorily which of the two simultaneous and taxonomically identical binomials *U. caulocarpum* and *U. stipulosum*, should be retained for the species, in as much as he considered them only as varieties; (2) that Merrill was the first to reduce one to the other as species and therefore, (3) that one should follow Merrill and adopt *U. stipulosum* in preference to *U. caulocarpum*. On the other hand, Merrill has nowhere mentioned *F. caulocarpa* (Miq.) Miq. (the Urostigma) and has confused with it *F. caulocarpa* Miq. (the Covellia) *e.g.* Beccari's Bornean record. This paper, in fact, is the first place in which the position has been stated fully and in which a selection has been made between *F. caulocarpa* (the Urostigma) and *F. stipulosa* in their specific rank in the genus Ficus.

F. hirta Vahl.

sensu King Ann. R. Bot. Gard. Calc. II, *1888*, 149.
Syn. *F. cordata* Ridley Journ. Straits. Br. Roy. As. Soc. 57, *1911*, 93.

F. hirta was omitted by Ridley from his Flora of the Malay Peninsula. We have in Singapore, however, a collection of this species from Perak by Wray and identified by King (no. 3413), and a collection of Ridley's from Pahang (no. 13720) identified by Ridley. Recent collections show that it is a common species in the mountains of the main-range. I find that the structure of the perianth is variable: in gall-flowers, the sepals are generally free or slightly joined at the base, but in the female flowers they are more or less joined, and in extreme cases, the perianth is a cup with 2–4 lobes clasping the lower half of the ovary. In other respects our Malayan specimens agree exactly with King's description and illustration.

Of *F. cordata* we have a sheet of the type-collection in Singapore. It is identical with the entire-leafed state of *F. hirta*. The specimen has ripe female receptacles from which I have checked the structure of the perianth, style and seeds.

F. infectoria Roxb.

As yet there is no evidence that this species occurs in Malaya, unless one regards *F. caulocarpa* (Miq.) Miq. as a variety of it. My reasons against such a procedure I have given under that species. The records of *F. infectoria* in Ridley's Flora are, with the exception of "Malacca (Griffith)" which I have not seen, either *F. glabella* or *F. superba:* 'Bukit Timah' and 'Langkawi' are *F. glabella* and the rest are *F. superba.*

I think that *F. infectoria* and its varieties are still unsatisfactorily defined and that all this group of Urostigma

is sadly in need of revision with the aid of ample, recent collections. We want, in fact, the opinion of a botanist who has purposely studied living trees and carefully examined the full-grown receptacles and dissected the flowers. I have been greatly impressed by the specific constancy of venation, of characters of the fresh receptacle and of the structure of the flowers in the whole subgenus, and am therefore doubtful that *F. infectoria*, as understood by King, should really be so variable.

F. Miquelii King, Ann. R. Bot. Gard. Calc. II, *1888*, 106.
Syn. *F. caulocarpa* Miq. Ann. Mus. Lugd. Bot. III, *1867*, 235 & 297.
non. *F. caulocarpa* (Miq.) Miq. l.c. 268.
E. D. Merrill Bibl. Enum. Born. Pl. *1921*, 221: Plant. Elm. Born. *1929*, 47.

I have pointed out under *F. caulocarpa* (Miq.) Miq. that Miquel's specific epithet 'caulocarpa' must be retained for a species of Urostigma and that one cannot follow Merrill's procedure and adopt the epithet for the Covellia which King named *F. Miquelii*. Merrill's reference of *F. caulocarpa* in Beccari's Nelle Foreste di Borneo (p. 525) to the Covellia species is mistaken: Beccari described *F. caulocarpa* Miq. as an epiphytic, strangling fig like *F. glabella*, and for the Covellia he consistently used the name *F. Miquelii*. It seems, therefore, that *F. caulocarpa* (Miq.) Miq. [= *F. stipulosa* (Miq.) Miq.] is in need of being recorded for Borneo.

F. patens Ridley
Journ. Str. Br. Roy. As. Soc. 86 *1922*, 306.

There is no specimen of this in the Singapore Herbarium that has been cited by Ridley. The types are perhaps at Kew. From the description of the habit of the plant, its large ovate-cordate leaves with round basal lobes and scabrid upperside, short bristly hairs, densely hairy and shortly peduncled receptacles, and long-stalked female flowers with 4 purple-spathulate sepals, I am convinced that Ridley's species is merely *F. fulva* Reinw. Saplings and small trees, up to 20′ high, of *F. fulva* have such cordate leaves and spreading habit. *F. fulva* is also a very common and striking plant in the mountain passes in Malaya, as Ridley stated for his *F. patens*.

F. Scortechinii King
Corner in Mal. Br. Roy. As. Soc. Journ. XI. *1933*, 36.
Syn. *F. Yatesii Merrill;* Pap. Michig. Acad. Sci. Art. & Lett. XIX, *1933*, 154, t. XVIII.

In my previous description of this species I was doubtful of the colour of the mature receptacles which I erroneously took to be yellow. I have since found several fruiting

trees and in all cases the ripening receptacles changed from yellow to rose-red or brownish crimson, though the orifice was occasionally yellow: they are green, or even brownish for a long while, when young.

I have not seen the type of *F. Yatesii* but from the description and illustration I am convinced of its identity with *F. Scortechinii.* The only differences are that Merrill does not describe any ridges on the receptacle and he says that the female flowers ('floribus fertilibus') have no perianth. The ridges are easily mistaken for wrinkles of contraction on the dried receptacles and the perianth is very minute in *F. Scortechinii.* The collection Krukoff 4107, identified as *F. Yatesii* Merrill, is *F. Scortechinii:* there is a specimen in the Singapore Herbarium.

F. superba (Miq.) Miq.

This is undoubtedly a common and widespread species of Urostigma on sandy coasts and rocky headlands in Western Malaysia, if not throughout the Malay Archipelago. But oddly enough, it has seldom been collected and is recorded only from Java and Indo-China (vide Koorders and Valeton, Bidjr. Booms. Java XI, 1906, 133: Gagnepain, Fl. Gen. Indochine. V. p. 773). To these countries I now add Malaya, where it is perhaps the commonest sea coast fig tree from Perlis and Kelantan to Singapore. I have collected it many times both sterile and in fruit. The description given by King and the emendments of Koorder's and Valeton leave no doubt of its identity: the massive twigs, tomentose stipules, long-stalked and large-bladed leaves and ramiflorous receptacles distinguish it. I believe, however, that the species is commonly mistaken for *F. infectoria.* Such has been the case in Malaya, the records of *F. infectoria* in Ridley's Flora of the Malay Peninsula being mostly *F. superba,* a few *F. glabella.*

Miquel doubtfully referred *F. timorensis* Decne to *F. superba,* suggesting that it was a mixture. King quoted Miquel but he refrained from an opinion as he had found no specimen. Judging from Decaisne's description (Herb. Timor. Descr. 1835, 167) I consider the identity most unlikely because the stipules are described as glabrous, the leaves as unusually short, broad, ovate and coriaceous, and the petiole as only an inch or so long.

Sloetia elongata Koord.

I do not find that the fruit has been correctly described. Ridley described "the small globose white nut" as "half-enclosed in the sepals of the female flower which, when ripe, are swollen, pulpy, succulent, sweet and white" (Dispersal of Plants, *1930,* p. 412) and, on p. 674 of the

same work, remarked that only two of the calyx-lobes swell. But, after examining many ripe fruits, I have found that none of the sepals is swollen. The small round *seed* (= Ridleys "achene") is enclosed in a very thin, white ovary-wall: this enlarged ovary is gripped firmly between the two large lobes of the swollen, white, fleshy, U-shaped *receptacle:* and the receptacle is wrapped round by the 4 thin, pale green, enlarged but not swollen sepals. When the receptacular lobes are pressed together, or even touched, they close with a soundless snap; the ovary instantly dehisces by a slit at right angles to the plane of the receptacular lobes and the seed is squirted out for several yards. It is the pulpy receptacle which is the conspicuous and edible part of the receptacular fruit. The "fruit" is therefore similar to that of Streblus.

Taxotrophis ilicifolia Vidal

Merrill has suggested that the right name for this plant is *Taxotrophis macrophylla* (Bl.) Bœrl.: "The proper name for the species seems to be *Taxotrophis macrophylla* (Bl.) Bœrl., based on a Celebes specimen" (Enum. Philipp. Pl. II p. 38). In Hutchinson's monograph of Taxotrophis (Kew Bull. 1918, 147), *T. macrophylla* is given as "species imperfecte cognita". Without more botanical evidence, for the species is yet known only from Blume's description, one cannot discard Vidal's name on the basis of a doubtful identification.

If Blume's species can be shown to be the common plant called *T. ilicifolia,* then it is the unusual form with the leaf-edge "distanter obtuse serrulatis". I doubt, however, if the examination of Blume's specimen will be final. The leaves of *T. ilicifolia* vary greatly in shape, some of their forms resembling those of other species. Blume's species might be *T. Balansae,* for instance. I think the identity of Blume's species cannot be determined until it is known, from extensive collections, what species of Taxotrophis grow in Celebes and how they vary.

EUPHORBIACEAE

Baccaurea: *Tampoi Trees*

"Tampoi" is the Malay name for wild fruit-trees of Baccaurea having large, round, thick-skinned fruits in bunches of 2–5 on the branches and with sour-sweet, opaque pulp round the seeds. The name is used in contrast to "Rambai" which indicates the fruit-trees of Baccaurea having oblong, thin-skinned fruits born in strings from the trunk or main branches and with translucent pulp. In fact,

Tampoi is to Rambai very much as Duku is to Langsat (*Lansium domesticum*).

The first Tampoi to be described was *Hedycarpus malayanus* Jack (Trans. Linn. Soc. XIV, *1825*, p. 118). It was transferred to Baccaurea by Hooker as *B. malayana* (Jack) Hook. f. (F.B.I. V, *1890*, p. 374). The Tampoi-trees escaped the earlier botanists probably because they are scattered forest trees and have not been brought into cultivation, though in season the fruits are sold in the markets.

Now, so far as I can discover, Jack's Tampoi has never been identified again, and it is not represented by a herbarium-specimen. It was described from Sumatra where it was well-known to the natives. Nevertheless it has become customary to refer the Tampoi of Malaya to *B. malayana* (c.f. Ridley's Flora Mal. Peninsula, Burkill's Dictionary).

During the last few years, I have taken every opportunity to study the Malayan Tampoi, both from the fruit in the market and from the wild trees. For numerous fresh specimens from Perak, Kedah and Kelantan I am greatly indebted to the Agricultural Officers of these States, namely Mr. J. N. Milsum, Tungku Yacob and Mr. R. G. Heath. I conclude that the Malayan Tampoi belongs mainly to the two species, *B. Griffithii* Hook. f. and *B. reticulata* Hook. f., the fruits of which are very similar. Those of *B. Griffithii* are grey-brown with white pulp, whereas those of *B. reticulata* are clearer or lighter brown with yellowish pulp. *B. velutina* Ridley may also be reckoned as a Malayan Tampoi but I consider that it is only a hairy-leafed form of *B. reticulata*.

I have compared Jack's description of *B. malayana* closely with those of *B. Griffithii* and *B. reticulata* which I have prepared and I conclude that the Malayan Tampoi-trees are different from the Sumatran for the following reasons:—

1. *B. malayana* has a broadly ovate lamina with rounded base. In *B. Griffithii* and *B. reticulata* the lamina is elliptic inclining to obovate with cuneate base. I consider this difference important because the lamina in most species of Baccaurea is slightly obovate with cuneate base. *B. malayana* is therefore peculiar in this respect.

2. *B. malayana* has 4 sepals and 4 stamens in the male flower, rarely 5. *B. reticulata* has 5 sepals and 5 stamens, rarely 4. *B. Griffithii* has 5 sepals and 6, rarely 5 or 7 stamens.

3. *B. malayana* has glabrous twigs and leaves. So has *B. Griffithii* but those of *B. reticulata* are more or less velvety.

4. That *B. malayana* should occur in Malaya, because of the agreement in local name and the proximity of Malaya and Sumatra, has no force of argument. *B. dulcis*, described in the same work by Jack as *Pierardia dulcis*, is also a common Sumatran fruit-tree but it has not been found in Malaya.

In Malaya, the wild species *B. macrophylla*, *B. pyriformis* and *B. bracteata* are called by such names as Tampoi Tunggau, T. Burong, T. Bunga, T. Tupai, etc. Their fruits are much smaller than those of the marketable Tampoi, are differently coloured and (? in all cases) dehiscent so that they are also called Jintek.

The Malayan collections which Hooker and Ridley have referred to *B. malayana* really belong to Cheilosa, as I will show at greater length in another paper. They are "Maingay, Malacca" and "Kunstler, Perak". Kunstler's duplicates at Singapore have the glandular serrate leaves and velvety fruits with uniovulate loculi typical of Cheilosa. Mr. C. F. Symington informs me that Maingay's collection also belongs to Cheilosa.

It may be noted that "Taban", or "Tabau", is synonymous with Tampoi in parts of Pahang, and "Merkeh" is often used in Kelantan.

Conclusion

B. malayana (Jack) Hook. f. is a Sumatran fruit-tree, never again discovered since it was described in 1825. The Tampoi-trees of British Malaya belong to the two species *B. Griffithii* and *B. reticulata*. Maingay's and Kunstler's collections identified as *B. malayana* belong to Cheilosa.

B. sapida Muell. Arg.

DC Prodr. XV, ii. 459.

Synonym:—

B. Wrayi King ex Hook. fil., F.B.I. V, *1887*, p. 374.

I can find no difference between *B. Wrayi* and *B. sapida* unless it be that the bracts of the male inflorescence are always a trifle (.5–1 mm.) shorter in *B. Wrayi*, in which case sterile and female trees can not be distinguished. Hence I have no desitation in reducing *B. Wrayi*. The Malayan specimens of *B. Wrayi* and the fruit-tree called "Pupor" in Kedah agree exactly with Gagnepain's description of *B. sapida* (Fl. Gen. Indoch. V, p. 548) as well as with specimens of *B. sapida*, identified by A. T. Gage, in the Singapore herbarium.

Under *B. Wrayi*, Hooker gave collections of Wray and King's Collector from Perak as syntypes without quoting numbers. I suppose that they are King's Collector 6353 and 7005 and Wray 513, duplicates of which are at Singapore.

It seems that the colour of the fruits of *B. sapida* is variable. Descriptions of fresh specimens are much wanted.

Bridelia tomentosa Bl. Bijdr. *1825*, p. 597.

Clutia monoica Lour. (Fl. Cochinch. 1790, p. 638) has been identified by Merrill (Philip. Journ. Sci. Bot. 13, 1918, p. 142 and Trans. Am. Philosoph. Soc. XXIV, 1935, p. 234) with *Bridelia tomentosa* Bl. and the name *Bridelia monoica* (Lour.) Merrill proposed in consequence. Merrill states that Loureiro's description of *C. monoica* agrees exactly with *B. tomentosa*, excepting in the fruit, and that this disagreement can be overcome by supposing that Loureiro never saw the fruit of his *C. monoica* but copied for it the generic character of *Clutia*. Merrill states that *Br. tomentosa* is common in the vicinity of Canton, where Loureiro said that his *C. monoica* was spontaneous. No other plant agreeing with *C. monoica* has apparently been found there and certainly no species of Cleistanthus to which genus *C. monoica* has been transferred by other authors. There is no specimen preserved of Loureiro's species. In spite of such arguments I cannot agree with Merrill's conclusion. A detailed comparison of Loureiro's description of *C. monoica* with living plants of *B. tomentosa* in Singapore and dried specimens from Malaya, Java and Sumatra in the Singapore Herbarium shows that Loureiro's description is far from being applicable to Blume's species. I analyse the position as follows:—

Of *Clutia monoica*, Loureiro says

(1) "Arbuscula 5–pedalis":

"A Clutia stipularis (Lin. sp. 7) habitu magis differt, quam flore". It is clear that *C. monoica* was a small plant no bigger than a man. *Bridelia tomentosa* is a tree, growing to 60′ high, developing a trunk as thick as a man's leg, and often with thorny branches: in Singapore, where it is common, it does not flower before it is 10′ high and not often as soon. Whether *B. tomentosa* is perpetually dwarfed in the vicinity of Canton, there is no information but the notion seems improbable.

(2) "Folia ..... glabra ..... stipulis nullis".

The undersides of the leaves and the leaf-stalks and the twigs of *Bridelia tomentosa* are characteristically pubescent or thinly tomentose. The leaves have a pair of lanceolate stipules 3–6 mm. long which cover the leaves in the bud and remain until they are removed to a distance of 4–10 internodes from the terminal bud, and the stipule-scars can be seen on the twigs behind their leafy portions.

In saplings the stipules are larger. I consider the evidence of the stipules sufficient of itself to refute the identification of Blume's species with Loureiro's.

(3) Of the male flowers "petala. ..... turbinata" "Stylus columnaris ..... apice obtuso, 3–fido".

The petals of *B. tomentosa* are minute, flat and obovate and the apex of the staminal column is blunt and obscurely 4–lobed.

4. Of the female flowers "stylis 3, brevibus".

The female flowers of *B. tomentosa* have 2 short styles each with 2 knob-like stigmas.

(5) "capsula 3-loculari, 1-sperma"

The fruit of *B. tomentosa* is a 1-celled, 1–2 seeded berry, never 3–angled. Merrill, in admitting this disagreement, says "It is evident that here Loureiro described his species from flowering specimens and added fruit characters to make his description conform to the characters of Clutia in which genus he erroneously placed his species". But, even allowing this inference, for which I can find no grounds whatever, how came it that Loureiro said the male flowers had a trifid style ("stigma dicas, si velis") and the female flowers 3 styles? Could it be that Louriero did not describe his species from flowering specimens? The words "capsula 3–loculari, 1–sperma" conclude the description without misgiving.

It is evident that *C. monoica* and *B. tomentosa* are generically distinct. If one begins to make allowances in Loureiro's descriptions, which are surprisingly accurate, it will be possible to identify *C. monoica* with *Flueggia virosa*, which extends into S. China, or with a species of Breynia. I consider *C. monoica* Lour. as an unexplained species.

Claoxylon indicum Hassk.

Merrill has reduced *C. indicum* to *Croton polot* Burm. f. and made the combination *Claoxylon polot* (Burm. f.) Merrill (Interpr. Herb. Rumph. p. 200). Not the least reason can I find for this change. Later (Philip. Journ. Sci. 19, 1921, p. 361), Merrill wrote "Burman based his description on an actual Javan specimen which must typify his species in spite of the fact that he took his specific name from *Folium urens s. polot* Rumph. Herb. Amb. 3: 217, t. 141. The specimen described is clearly the species commonly known as *Claoxylon indicum* Hassk. The Rumphian reference must be excluded, as it represents *Laportea amplissima* (Blume) Miq." This statement is so confused that it is necessary to analyse it in detail.

1. Burman's description is as follows:

"Croton (*Polot*) foliis obovatis integerrimis nervosis scabris.

Folium urens f. Polot. *Rumph. amb.* 3. p. 217. t. 141.
Blacka Tupœ Javanis.
Habitat in Amboina Java".

Now it is not clear from this that "Burman based his description on an actual Javan specimen". But when one compares Burman's few words with Rumphius' description and figure which are quoted, they will be found to agree exactly with Rumphius' plant and probably they were taken directly from Rumphius, as well as the specific name. Rumphius' plate must therefore be admitted as the type of the species. On the other hand, should there be a specimen from Java labelled both "Blacka Tupœ" and "Croton polot" in Burman's herbarium, and should the specimen agree with Burman's description, then it can be admitted as a syntype with Rumphius' plate. But if such a specimen disagrees with Burman's description it must be excluded from the interpretation of Burman's species: because in the event of specimens belonging to more than one species being cited under an original description, those which agree least with the description must be rejected as misidentifications.

Burman's description cannot refer to *Claoxylon indicum* Hassk. because *C. indicum* has ovate, denticulate leaves, softly tomentose beneath and nerves that are not scabrid; and Rumphius figure shows a panicled inflorescence very different from the spike-like inflorescence of *C. indicum.* If Burman's specimen of "Blacka Tupœ" exists and can be proved to be *C. indicum,* then it cannot be taken as the type of *C. polot* in place of Rumphius' plate which fulfils all the demands of the description.

2. After his description Burman has added in small type:—

"Varietatem hujus ex Java accepimus, quæ foliis mollissimis tomentosis denticulatis, venis lucidis differt.'

If this note is what Merrill has considered to refer to *C. indicum* Hassk.—and a softly tomentose, denticulate leaf with shining veins, of Javan origin, is hardly of itself so significant—it is evident that Burman intended it to refer to a variety, that he did not name, of his *C. polot.* If the note really refers to *C. indicum,* which only a discovery of Burman's specimen can prove, it in no way affects the description and typification of *C. polot,* but must be regarded as based on a misidentification.

3. It has yet to be shown that *Urera amplissima* Bl. is the same as *Folium urens latifolium* of Rumphius. The panicle of Blume's figure is unlike that of Rumphius and neither plant is known to botanists.

4. It has yet to be shown that *Laportea amplissima* Miq. is the same as *Urera amplissima* Bl. The species are based on different types. *L. amplissima* Miq. was based on collections by Teysmann and Zippel and Miquel referred Blume's figure of *Urera amplissima* to his own *L. amplissima* with a query. There can be no such name as *L. amplissima* (Bl.) Miq.

5. It has yet to be shown that *L. amplissima* Miq. is the same as *Folium urens latifolium*. The specimen, "C. B. Robinson Plant. Rumph. Amboin. no. 313" identified as *L. amplissima* (Bl.) Miq. may well be *L. amplissima* Miq. but it can scarcely be referred with confidence to Rumphius plate and description.

My conclusions are these:—

Croton polot Burm. f.
= *Folium urens latifolium* Rumph. Herb. Amb. 3: 217, t. 141, which figure must be taken as the type of *C. polot* Burm. f.

Claoxylon indicum Hassk. is not *Croton polot* Burm. f.

Urera amplissima Bl. is a species known only from Blume's figure.

Laportea amplissima Miq. is a good species having Teysmann's and Zippel's specimens as syntypes. Whether it is *Croton polot* Burm. fil. or not, has yet to be shown.

Croton lævifolium Bl.
= *C. Griffithii* Hook. fil. F.B.I. V. p. 392.
= *C. oblongum* Burm. fil. Flor. Ind. p. 206, t. 62 sec. Merrill Phil. Journ. Sci. 19, *1921*, p. 361.
= *C. confusum* Gage Rec. Bot. Surv. Ind. IX, *1922*, p. 237.

The Malayan specimens of *C. Griffithii*, named by Hooker, Gage and Ridley, agree exactly with Smith's description of *C. laevifolium* (Bijdr. No. 12, Boomsorten op Java, p. 343) and with specimens from Buitenzorg named by Smith. I have no hesitation therefore in referring *C. Griffithii* to *C. laevifolium*. No one has yet shown how they can be separated. Hooker himself wrote "It is possible that this (*C. Griffithii*) is the true *laevifolium* of Blume".

I find that *C. laevifolium* in Malaya is exceedingly variable in size and shape of leaf, in size of inflorescence and in grouping of flowers, though the structure of the flowers, the venation, the two glands at the top of the petiole and the stellate hairs are very constant: the essential characters that is to say, are always present. The grouping of the flowers is varied and difficult to determine from herbarium sheets because the flowers become broken off, male flowers fall readily in the press, female flowers persist unpollinated on the inflorescence for some days after the

males have fallen, and small inflorescences or lateral ones may be wholly male. It is thus impossible to recognize Gage's species, *C. confusum*. Moreover, one cannot recognise varieties from herbarium specimens without being led into numerous details necessitating forms and sub-forms, and these may apply only to a branch or two of the same tree.

I doubt if any botanist will agree with Merrill in referring *C. laevifolium* Bl. so well described by Smith, to *C. oblongum* Burm. f. on the evidence of the inappropriate words "foliis oblongo-ovatis integerrimis". The leaves of *C. laevifolium* are generally more or less serrulate or even serrate—"distanter serrulatis" (Blume): the blade of *C. laevifolium* has 6–12 prs of main side-veins—Burman's figure shows 6(–7): the blade of *C. laevifolium* is generally acuminate—Burman's figure shows a simply pointed blade very exceptional in *C. laevifolium*. Burman's figure and description could be turned to fit many a Croton so that, unless there is an authentic specimen, *agreeing with Burman's figure, C. oblongum* must remain a dubious species. Its country of origin is unknown so that we have a choice of Crotons from the Moluccas to Africa and from China to Java.

Drypetes pendula Ridley Kew Bull. *1923*, p. 365.

The following points may be added to the original description:—

> *ovary* 3-celled; *fruit* globose, 3 cm. wide, containing three cocci: *cocci* 2–2.2 cm. long × 1.8–1.9 cm. wide × .9 cm. thick, large, ovoid, compressed, pointed at one end, blunt at the other, with a deep median longitudinal sulcus on both broad surfaces and continuous over the blunt end, with the wall bony, 1.5 mm. thick, and deeply reticulately sulcate.

The species differs from *D. longifolia* especially in being wholly glabrous excepting the ovary and fruit, in having 5 sepals on both male and female flowers, 3 stigmas, 3-locular ovary and 3 bony, deeply sulcate and reticulate cocci in each fruit. Its leaves, moreover, are generally larger, and thicker, and with a broad asymmetrical base deeply cordate on both sides: the reticulation between the main side-veins is also coarser. But the base of the leaf varies considerably from broadly, though unequally, cuneate to deeply cordate: whether this depends on the age of the plant is not known.

The young twigs are often ant-inhabited. Such are hollow and have a little hole, 1 mm. wide, on the surface a short distance below each node: on tapping the twigs an ant pokes its head from each hole. Nevertheless plants can be found without ants and with solid twigs.

Whereas *D. pendula* is thus abundantly distinct from *D. longifolia*, it is not at all evident how *D. myrmecophila* Merrill should differ from the Java plant except in being less hairy. I consider that the two Bornean collections—Boden Kloss 19047, Elmer 20272—referred by Merrill to *D. macrophyllum* Bl. are certainly *D. myrmecophila*. *D. macrophyllum* Bl. has been reduced to *D. longifolia* by Moore (Journ. Botany 1925 Suppl. p. 97). Very little is known of any of these plants.

Endospermum

E. malaccense Muell. Arg.
Flor. Ratisb., *1864*, p. 469.
Syn.:—
E. borneense Muell. Arg., loc. cit.
E. ovalifolium Pax et K. Hoffm., Pflanzenr. IV, 147, 4, p. 34, *1912*.
E. Beccarianum Pax et K. Hoffm., loc. cit.
E. chinense var. *malayanum* Pax et K. Hoffm., loc. cit.

My reasons for these reductions are derived not from examination of type-specimens but from observation of the Malayan trees of *E. malaccense*, which I find to be most variable and to comprise the "specific" characters of the four synonyms.

In distinguishing the four species Pax, Hoffman and Mueller give only vegetative differences concerning the shape, hairiness and venation of the leaf and the presence or absence of foliar glands: inflorescences, flowers and fruits appear to be identical. Before analysing these differences I must state that my conclusions rest on the examination of 48 herbarium sheets of *E. malaccense* and *E. ovalifolium* and of many living trees in Singapore, Johore, Perak and Penang. It seems that Mueller based his two species on two specimens and that Pax and Hoffman had seen only four specimens of the four species. There was a tree in Singapore on which I found all four species but it has, alas, been felled.

The Shape of the Leaf. In *E. malaccense* the leaf varies from ovate-acuminate and deeply cordate (27 cm. wide and long) on seedlings, saplings, young trees and sucker-shoot to elliptic obovate with cuneate base and short tip (7×4 cm.) on mature trees. The sapling-leaves are membranous and occasionally have 3–5 points but they are never peltate as in *E. moluccanum*.

The mature trees have more or less coriaceous foliage, in which the lamina may be ovate and subcordate or elliptic or of an an intermediate shape. The leaf-shape often varies on different twigs and even on the same twig, the earliest formed leaves and those on the upperside of the twig being

more elliptic or with cuneate base than the later leaves and those on the underside of the twig which incline to ovate-cordate.

The Hairiness of the Leaf.—The underside of the leaf of *E. malaccense* varies from velvety-tomentose to nearly glabrous and from simply hairy to stellately hairy. The leaves of saplings have the tomentum composed of simple hairs and such, in the dried state, are greyish brown underneath. In mature trees, stellate hairs are formed between the simple hairs and the simple hairs become tufted or stellate with long arms themselves. These mature leaves have thus on the underside a dense pile of apparently simple hairs below which is a stratum of thousands of stellate hairs: and, in the dried state, the undersides are greyish yellow. As the leaves weather, the longer hairs disappear and only the stratum of stellate hairs may be left. But some trees, no matter what their leaf-shape, may have only sparsely hairy undersides to the leaves. There are, however, all gradations from the sparsely puberulous blade of the collection, Singapore Field No. 28670, to the velvety tomentose state of Wray's and Curtis's collections.

The Venation. In *E. malaccense*, the primary lateral veins of the leaf vary from 3–7 pairs and the basal veins from 5–7 according to the shape of the blade.

The Leaf-Glands. The full complement of glands on the leaf comprises a pair at the top of the petiole and one in the fork of each primary lateral vein near the margin on the underside of the blade: these glands are green and knob-like. Some trees have no glands at all, others have glands only at the top of the petiole and others have glands only in the nerve-axils. It is not uncommon to find a tree some leaves of which have one or other gland and others have no glands.

As I write, I have before me a twig from a tree in Singapore and on this one twig are ovate leaves with cordate, subcordate and rounded bases, elliptic-ovate leaves and elliptic-obovate leaves with cuneate base: the blades have 4–6 pairs of primary lateral veins: some blades have no glands, others have glands in a few of the nerve-forks and one has a pair of petiolar glands: the undersides of the leaves are sparsely velvety with simple hairs and scattered stellate hairs.

E. ovalifolium Pax et Hoffm.

This is based on a specimen from Bukit Timah, Singapore, which may be a duplicate of J. S. G(oodenough), 5042, 14.4.1893. It represents the extreme variation of the leaves to the elliptic state with cuneate base, slightly hairy

undersides and without glands. There are many such trees at Bukit Timah, but their saplings have velvety cordate leaves with glands.

E. borneense Muell. Arg.

From the description, this is the state with subcordate leaves, dense stellate tomentum and the pair of petiolar glands. It is the usual state in immature trees of *E. malaccense*.

In reducing *E. borneense* to *E. malaccense*, I retain *E. malaccense* because I have interpreted the species from Malayan trees.

E. Beccarianum Pax et Hoffm.

This differs from the states of *E. malaccense* with ovate, subcuneate leaves in having 4 pairs of primary lateral veins. 4–5 pairs is general in such medium-sized leaves. Such a difference can, at most, be varietal but I think it has no classificatory significance whatever. I am unable to understand Pax and Hoffman's idea of a species. These authors describe two varieties of *E. Beccarianum*. Var. *crassirameum* has thick twigs with close-set leaf-scars and var. *tenuirameum* has slender twigs with distant leaf-scars. "An olim melius notæ pro speciebus sumendæ erunt?", the authors enquire. The branches of Endospermum are sympodial with upturned rosettes of leaves as in Terminalia, Sterculia, Elæocarpus, Alstonia, Fagræa, Palaquium, Baccaurea, Macaranga and so on. A twig grows out with rapidly lengthening internodes: when the apical bud is sufficiently projected from the parent branch, the bud turns upward and produces the rosette of leaves on a thickened axis. Slender twigs thus precede thick twigs invariably.

E. chinense Benth., Fl. Hongkong, *1861*, p. 304.

The differences between this and *E. malaccense* seem to be the larger, subsessile fruit (10 mm. long in *E. chinense*) and the much shorter fruit-racemes (5 cm. long in *E. chinense*, 8–20 cm. in *E. malaccense*). But I hesitate to reduce *E. malaccense* to *E. chinense* until the Chinese plant is better known and the male inflorescence has been described. However, *E. chinense* var. *malayanum* Pax et Hoffm. is *E. malaccense*. The variety is based on Forbes 2779 from Sumatra and this specimen evidently supplied the information about the male inflorescence which Pax and Hoffman have given for *E. chinense*. Bentham wrote "The male plant is yet unknown", and var. *genuinum* Pax et Hoffm. is based only on Bentham's specimens.

E. malaccense thus becomes a wide-spread species of the Sunda-shelf, except for Java which it may never have reached. It is a very variable, common tree.

E. perakense King ex Hook., F.B.I., V, p. 458.

This is not an Endospermum but a Macaranga. I have not been able to identify it.

Gelonium glomerulatum (Bl.) Hassk.

The difference in the number of stamens between this species (20–35 stamens) and G. *bifarium* Roxb. (12–18 stamens), as given by Pax and Hoffmann, does not hold in every case (Pflanzenr. IV. 147, IV p. 18–19). Two collections from Malaya, Burn-Murdoch 350 (Beserah, Pahang) and Burkill 1129 (Pulau Tioman, Pahang) have only 11–15 stamens in the male flowers which are slightly smaller than usual. But in every other respect these collections are identical with typical *G. glomerulatum*. It is not clear how *G. bifarium* differs from *G. glomerulatum* unless in the relatively narrower, longer stalked leaves and the 2–, rarely 3–, locular ovary and fruit. There is only one collection from Malaya in the Singapore Herbarium which agrees with the description given by Pax and Hoffman, namely Sing. Field. No. 18567. Like many variable Euphorbiaceous species, those of Gelonium have been overdescribed.

MELASTOMA

Three species are recorded for Malaya by King in his "Materials" and ten by Ridley in his "Flora". After having given considerable study to the living plants I am unable to distinguish more than five species. There is no structural difference in the flowers of any so that all may be regarded as varieties of *M. malabathricum*.

Key to the Species

Calyx set with spreading bristly hairs (like a rambutan); the seed-pulp yellow or red
- Leaves glabrous; open places and forests .. *M. sanguineum*
- Leaves very hairy; by forest-streams only *M. molle*

Calyx with adpressed hairs, bristles or pointed chaffy scales; seed-pulp purple black
- Leaves dull dark green, velvety on both sides; flowers 2–3″ wide; mountains .. *M. muticum*
- Leaves not velvety or only on the underside, rather light green
  - Leaves ¼–2″ wide, with stalks ¼–½″ long; flowers 1–3″ wide; very common, lowland and mountain .. .. *M. malabathricum*
  - Leaves 2–4″ wide with stalks ½–2″ long; flowers 1–2″ wide; occasional in the mountains .. .. *M. imbricatum*

M. imbricatum Wall.

The wide leaves, harsh on both surfaces, the dense clusters of small, almost sessile flowers and the small scales on the calyx distinguish this species. It is the least common Malayan species and one the variation of which is unknown.

M. malabathricum L.

Synonyms:—

M. polyanthum Benth., Fl. Aust. III, p. 292.
M. normale Don, Prodr. Fl. Nep. p. 220.
M. scabrum Ridley, Journ. Roy. As. Soc. Str. Br. 79, *1918* p. 66.

On account of the great variation among the plants which must be identified as *M. malabathricum* in the wide sense, no satisfactory classification of them has been proposed. Most authors endeavour to distinguish *M. polyanthum* on the basis of small, caducous bracts and short sepals but these properties are connected with the normal by so gradual a series and are in the extreme combined with so many other variations such as size of flower or hairiness of leaf that *M. polyanthum* is as miscellaneous an aggregate as *M. malabathricum.* The variable features are the length of the scale on the stem, petioles and calyx, the size, colour and hairiness of the leaves, the harshness of the hairs, the colour of the hairs, scales and leaf-veins (whether suffused with anthocyan or not), the size of the bracts, the length of the sepals and whether they have glabrous, hairy or scaly edges, the length and colour of the petals (deep or pale magenta or white), and the number of flowers in the head. My observations tend to show that these variations are not correlated so that very many forms must be distinguished if one is to distinguish any: and all these are probably mutually fertile and thus constitute one natural species.

M. normale is a form with hairy undersides to the leaves, in which respect it approaches *M. muticum.* But I see no more reason to stress the length of the hairs of the leaf than the intensity of colour of their cell-sap. Many other variations are differently combined with the hairiness of the leaves.

M. scabrum is merely a form with rather harsher hairs on the leaf and stem than usual, and such a feature is not a specific one. A specimen of the type-collection (Ridley 15813) is in the Singapore herbarium.

M. molle Wall.

There are specimens which seem to connect this with *M. muticum* but the colour of the seed-pulp appears to be distinctive. However it is also a variable species very insufficiently known.

M. muticum Ridley.

Journ. R.As. Soc. Str. Br. 61, *1912*, p. 4.

The distinctive character of this species was given by Ridley as "having the stamens all similar". There is a specimen of the type-collection (Ridley, Hulu Semangkok)

at Singapore: it has one open flower in which are both long and short stamens typical of other species of Melastoma. I have studied the species in the type-locality, where it is the commonest mountain Melastoma, and found that it normally has 5 long and 5 short stamens exactly as *M. malabathricum* and that it varies, as in that species also, to 6 short and 4 long stamens or even 7 long and 3 short. But, though Ridley's character of the species is wrong, the dark green velvety leaves, large bracts, the long sepals, the long adpressed scales to the twigs, petioles and calyx, the large flowers and the mountain habitat distinguish it. It is likely to have been described from neighbouring countries but I have not detected an earlier name. It has been generally referred to *M. perakense*, *M. normale* and *M. molle* in the Singapore herbarium. Indeed, it is probably what King intended by *M. malabathricum* var. *perakense*.

M. sanguineum Sims

Synonym:—

M. schizocarpa Ridley, Journ. R.As. Soc. Str. Br. 59, *1911* p. 104.

The type-specimen of *M. schizocarpa* (Ridley, Ginting Kabok, Perlis) is at Singapore. It is a flowering specimen with one unattached fruit in a capsule. The character of the longitudinal dehiscence of the fruit, remarked by Ridley, seems to be normal to *M. sanguineum:* and in all other respects the specimen is typical *M. sanguineum* (= *M. decemfidum*).

M. perakense Ridley

Fl. Mal. Pen. 1, *1922*, p. 764.

= *M. malabathricum* var. *perakense* King Mat. Fl. Mal. Pen. III *1900* p. 415.

This species is a *mixtum compositum*, consisting of *M. muticum* and specimens which I would refer to *M. molle*.

Of the specimens cited by King I would refer the following as short-haired forms of *M. molle*:—Curtis 1298, Ridley 2935, Scortechini 780, Wray 1733. Whereas Ridley 1996 is *M. muticum*.

Of the specimens cited by Ridley, the following are *M. molle*:—(Batu Pahat) Kelsall and Hermitage Hill (Curtis). The following are *M. muticum*:—Bukit Hitam (Ridley), Thaiping Hills (several collections), Telom, Gunong Lesang (Foxworthy).

DURIO

There is much confusion among the Malayan collections. They show that the species must vary considerably in the size of the leaf, the size of the scales on the underside of the leaf, the size of the flower, the length of the staminal tube, and, perhaps, the colour of the petals, whether white or pink. The classification which I offer is tentative because many more collections must be made and the species must be studied in the forest before the genus can be understood. It is necessary to know, for instance, on what part of the plant the flowers or fruits are born and what is the colour of the flower. In some species or varieties, flowers only are known and in others only fruits: efforts must be made to collect both flower and fruit from the same tree.

The genus has been revised recently by Bakhuizen van den Brink (Bull. Jard. Bot. Buit. Ser. III, vol. 6, *1924*, p. 224). But I cannot agree with his treatment of some of the Malayan species *e.g. D. Wrayii* which is certainly misinterpreted. Among the six species described by King, I find that only three are acceptable and of Ridley's nine there are but two.

KEY TO THE MALAYAN SPECIES

Leaves rather small, 7–18 × 3.5–6.5 cm., *more or less glaucous beneath* and stellate pilose, not or scarcely scaly except on the main veins; *flowers small*, 2–3 cm. wide or less; *petals 4;* staminal tube none

- Leaves very finely hairy beneath, matt; *flowers* 2 cm. wide or less, singly or a few together in the axils of the leaves or on the twigs just behind, *cream-white*, subsessile; *stamens free; fruit small, oblong fusiform*, 3.5–7.5 × 1.5–2.5 cm., *green then red, densely set with short spines* 2–4 mm. long, splitting into 2–4 parts; *seeds* black with a tiny orange aril round the hilum .. *D. Griffithii*
- Leaves distinctly hairy beneath, subtomentose; *flowers* 2.5–3 cm. wide, in clusters on the branches; *calyx* with big scales, cup-shaped with 4 short lobes; *petals* ? *white or pink; stamens* 1.2 cm. long, joined in four bundles; *fruit* like that of *D. zibethinus* but set with closer narrower spines 1 cm. or more long; *seed* covered by the aril .. *D. Oxleyanus*

Leaves wholly scaly on the underside, *not glaucous but silvery or brownish; flowers* 4 cm. or more wide; *petals 5; stamens* grouped in 5 bundles (phalanges)

- Calyx cup-shaped with 5 short lobes; *petals* obovate with a narrow stalk; *ramiflorous;* leaves 6–18 cm. long
  - Staminal phalanges joined into a tube for a third the length of the stamens .. *D. malaccensis*

Staminal phalanges not or scarcely joined
Flowers white .. .. .. *D. zibethinus*
Flowers red .. .. .. var. *roseiflorus*
Calyx divided completely into 5 sepals; *petals* sessile, ovate-oblong; *staminal phalanges* joined in a tube 1–7 cm. long, generally for half the length of the stamens
Ramiflorous; *flowers white; petals* very scaly outside; *staminal tube* 1–4 cm. long; *fruit* set with dense, narrow stiff rambutan-like spines, the calyx persistent; *aril* more or less covering the seed; *leaf* large, 17–30 × 4–9 cm. .. *D. oblongus*
Cauliflorous; *flowers red; petals* not or scarcely scaly outside; *staminal tube* 3–7 cm. long; *fruit* with broad pyramidal spines like *D. zibethinus*, calyx not persistent; *aril* incompletely covering the seed
Flowers large; *stamens* 9–10 cm. long; leaves more than 4 cm. broad
Lamina 10–20 × 4–6 cm., lanceolate elliptic .. *D. testudinarum*
Lamina 20–36 × 6–15 cm., broadly oblong .. .. var. *macrophyllus*
Flowers smaller; *stamens* 5–6 cm. long; leaves 1.5–4 cm. wide, lanceolate .. .. .. var. *pinangianus*

D. zibethinus var. **roseiflorus** var. nov.

Synonyms:—

D. Lowianus Scortechini ex King, Mat. Fl. Mal. Pen. I, *1891*, p. 161.

D. Wrayii King, loc. cit. p. 163.

A typo differt floribus minoribus, petalisque roseorubris, filamentisque stylisque carneis.

Typus: Sing. Field No. 33421, leg. E. J. H. Corner, pr. Kota Bahru, Kelantan, 21.4.37.

Collections:—

Kedah—SFN 12579 (Haniff).

Kelantan—SFN 33421 (Corner): Agric. Officer Kelantan, s.n. Aug. 1937.

Trengganu—Corner s.n. 29.4.37.

Perak—Scortechini 1767 (type of *D. Lowianus*); Wray 3684 (type of *D. Wrayii*); Barnard 39.

Selangor—C.F. 12079, 9997; Ridley s.n. May 1896 (flowers only).

Trees of this variety are occasional in villages in the north of Malaya. In Kelantan, near Kota Bahru, they are called *Durian Au* or *Di'au*: round Kuala Trengganu they are called *Durian Sepek*. The beautiful rose-red flowers distinguish it at once from the ordinary Durian, the petals and stamens of which are white, cream colour or distinctly yellow. The flowers also are smaller (see the following analysis) and the fruits have more crowded, more slender spines than is usual in the common Durian: the pulp round

the seeds, too, is bright yellow and there is no foetid smell whatever. Local Malays declare that the red-flowered Durian has fruits superior in quality to those of the common Durian but there is so much unclassified variation in these that the variety cannot as yet be distinguished except by the flowers. The leaves offer no difference from the common Durian but those of the two collections Barnard 39 and C.F. 9997, have unusually large scales, 1 mm. wide or more, on the undersides of the leaves (.5–.8 mm. wide in the common Durian and other collections of var. *roseiflorus*).

As regards *D. Lowianus*, specimens of the type-collection of which are at Singapore, I do not find that King, Ridley or Bakhuizen v.d. Brink have stated any real distinction from *D. zibethinus*. In ascribing white flowers to it, Ridley was in error because Haniff's collection from Kedah, which matches Scortechini's type exactly, has the field-note 'petals blood-red'. Bakhuizen v.d. Brink omitted the species from his key but suggested that it might be a small-flowered variety of *D. malaccensis:* but the staminal phalanges in *D. malaccensis* are said to be joined for a considerable distance, while those of *D. Lowianus* are almost or quite free.

D. Wrayii is no better characterised. The three type-sheets at Singapore show the flower to be smaller than in *D. Lowianus* though other collections bridge the difference. The caudate apex of the leaf, emphasized by King, can be found also in the common Durian. Bakhuizen v.d. Brink referred *D. Wrayii* to *D. testudinarum* which is certainly an error because *D. Wrayii* is ramiflorous and has the floral structure of *D. zibethinus*.

ANALYSIS OF THE FLOWERS

	D. zibethinus	var. *roseiflorus*
Pedicels ..	5–6 mm. wide	3.5–4.5 mm. wide
Expanded calyx	2.3–2.7 cm. long, 3–3.6 cm. wide	1.6–2 cm. long, 1.8–2.3 cm. wide
Petals ..	6–7 cm. long, 2.4–4 cm. wide, white, cream, or yellow	3–5.3 cm. long, 2 cm. wide, rose-red
Staminal bundles	5–6.5 cm. long; the filaments joined for 2–3 cm., white or cream, 1.5–2 mm. wide	2.5–4.5 cm. long the filaments joined for .8–1.5 cm., pink, 1 mm. wide: anthers cream
Style	white with yellow to orange stigma	pink with orange stigma

D. malaccensis Masters (emend. Beccari)

Journ. Linn. Soc. Bot. XIV, *1875*, p. 501.

According to Beccari, Master's description of *D. malaccensis* included two Bornean species which he (Beccari) subsequently distinguished as *D. affinis* and *D. testudinarum*,

having reserved for *D. malaccensis* the Malayan specimens collected by Griffith and Maingay (Malesia III, p. 237).

It seems, according to King, Beccari and Bakhuizen v.d. Brink, that the only structural character distinguishing *D. malaccensis* from *D. zibethinus* is in the andrœcium. The staminal phalanges are said to be joined for the lower third of the length of the filaments in *D. malaccensis*, whereas in *D. zibethinus* they are almost or quite free. Further, the calyx is said not to be urceolate-saccate in *D. malaccensis* but, as the calyx does not assume this characteristic shape (by turgor-pressure) until the flower is fully open in *D. zibethinus* also, I am doubtful of the value of the character as obtained from the herbarium. As judged by the staminal criterion, the records of *D. malaccensis* given in Ridley's Flora are all erroneous and belong mostly to *D. testudinarum*. Indeed, *D. malaccensis* has never been found again in Malaya. I am inclined to think that it is really no other than *D. zibethinus*, or a variety so rare that it is scarcely to be reckoned with the common wild Durians of Malaya.

In the figure 26, of Ridley's Flora, the leaves are *D. testudinarum* var. *pinangianus*, the fruit is *D. oblongus* (c.f. the spines and persistent epicalyx), and so are the flowers (c.f. the scaly petals).

D. oblongus Masters

Journ. Linn. Soc. Bot. XIV, *1875*, p. 500.

Synonym:—

D. singapurensis Ridley, Journ. Str. Br. R. As. Soc. 73, *1916* p. 143.

After carefully studying Beccari's extended description of *D. oblongus* (Malaysia III, p. 248), the five type-collections of *D. singapurensis* at Singapore, and several recent collections, I agree with Bakhuizen v.d. Brink in reducing *D. singapurensis* to *D. oblongus*. In Malaya, *D. oblongus* seems to occur only in the southern and eastern States, the affinity of which is generally with Sarawak where Beccari collected *D. oblongus:* and, thus, I think the species escaped King whose collections came mostly from the western and northern States.

D. oblongus approaches *D. testudinarum* in many ways, especially in the structure of the flower which is almost identical. The length of the staminal tube is very variable. I consider these its chief characters:—

A moderate-sized to large, unbuttressed tree with rather smooth, warm brown bark: *leaf-blade* 17–30 × 4½–9 cm. large, coppery beneath (when living), the scales on the underside of the leaf .5–1 mm. wide: *flowers white, always on the branches* in rather few-flowered clusters: *pedicels* 1–2 cm. long, short: *calyx* split into 5 free sepals more or less saccate at the base in full-open flowers, covered with large scales 1.5–3 mm. wide: *petals* 7–8.5 × 1.2–2.7 cm. *ovate-oblong, not clawed,*

with big scales on the outside as on the calyx, *white: stamens* 6–8 cm. long overall, the phalanges joined in a tube 1–4 cm. long, very variable even in flowers from the same tree: *fruit* 8–10 cm. wide, almost round, densely set with stiff rambutan-like spines or narrowly conical bristles 1.2–1.6 cm. long, the calyx and epicalyx persistent, the aril more or less covering the seed.

D. testudinarum Beccari

Malaysia III, pt. 4, *1886*, p. 244, tab. 13, 14.

King recorded this species for Malaya, but Ridley and Burkill excluded it. Nevertheless, I am certain that it occurs both in its typical form and in several varieties and that it is probably quite common in the forest. Indeed, it seems to present so many varieties that I think it is more likely to have had its origin in Malaya than in Borneo. I find it exceedingly difficult to distinguish absolutely from *D. oblongus* when there are no fruits and no collector's notes concerning the colour and position of the flowers. The obvious distinctions from *D. oblongus* are the position of the flowers near the base of the trunk, the larger pedicels, the relatively, and often absolutely, longer staminal tube, the large pyramidal warts on the fruit like those of *D. zibethinus* and the aril covering only a small part of the seed. Beccari adds that the base of the sepals are saccate, when fully expanded, in *D. testudinarum* and not so in *D. oblongus* but I find them saccate also in *D. oblongus* and, as I have mentioned under *D. zibethinus*, this character is of doubtful value. I will add, however, that all the evidence from the Malayan plants points to *D. testudinarum* having rose-red petals and pink filaments and style in contrast with the white flowers of *D. oblongus*. Neither Beccari nor anyone else has described the colour of the flowers in *D. testudinarum*.

Following King and Beccari, I regard *D. macrophyllus* and *D. pinangianus* merely as varieties of *D. testudinarum*. *D. macrophyllus* differs only in its larger leaf, and *D. pinangianus* in its smaller leaf and flower (though its fruits have not yet been collected).

Bakhuizen v.d. Brink referred *D. Wrayii* to *D. testudinarum* but, as I have said under *D. zibethinus*, this was an error.

The following seem to me the diagnostic characters of typical *D. testudinarum*:—

A small to medium-sized tree with red flowers borne on the trunk, generally at the base but sometimes on the bole.

Leaf-blade 9–20 × 3½–6 cm., lanceolate-elliptic, shaped exactly as in *D. zibethinus*, the scales on the underside fine (.5 mm. wide): petiole 1–2 cm. long.

Flowers constructed essentially as in *D. oblongus:* pedicels 2.5–5 cm. long: petals rose-red, with only a few scales on the outside or none: stamens 9–10 cm. long overall, the tube of the phalanges 4–7 cm. long.

Fruits like rather small fruits of *D. zibethinus* and covered with the same conico-pyramidal, pointed warts but the aril covering only the proximal part of the seed.

Malayan collections:—

Negri Sembilan—SFN 9773 (Holttum) (det. *D. malaccensis*).

Malacca—Goodenough 1993 (det. *D. macrophyllus*).

In this place I would put also the following specimens though there is no note of the colour or position of their flowers and they have larger scales (1–1.7 mm. wide) on the undersides of the leaves. They have, however, the small leaves and long staminal tube of *D. testudinarum*.

Penang—Curtis 401 (det. *D. zibethinus*).

Perak—Ridley 5352 (det. *D. macrophyllus*), Scortechini 821 (det. *D. malaccensis*), Wray s.n. 1889 (det. *D. malaccensis*).

Negri Sembilan—C.F. 23695 (det. *D. oblongus*).

Malacca—Derry 1208 (det. *D. malaccensis*).

D. testudinarum var. **macrophyllus** King

Mat. Fl. Mal. Pen. 1, *1891*, p. 163.

Synonym:—

D. macrophyllus Ridley, Fl. Mal. Pen. 1, *1922*, p. 264.

As syntypes of the variety, King gave the two collections Kunstler 7497 and Wray 3397. But these are not identical. Both have similar large leaves but Kunstler's field-note gives "petals waxy white" and Wray's gives "flowers on trunk near ground. .... petals rose-red deepest at the tips .... column pink, anthers cream". I prefer therefore to select Wray's collection, 3397, as the type in accordance with my interpretation of *D. testudinarum*. This being so, I cannot agree with Bakhuizen v.d. Brink who has reduced the variety to *D. oblongus*.

Ridley omitted Wray's collection from his definition of *D. macrophyllus* but gave Kunstler 7497, Goodenough 1993 (which is typical *D. testudinarum*), and, presumably, Derry 2731 (Lumut, Perak), though this collection he referred to Curtis and it seems to me a form of Wray's 3397 with unusually large scales on the underside of the leaf. Ridley's definition adds more confusion and I do not see, therefore, how his interpretation of King's variety can be followed.

This variety differs from typical *D. testudinarum* only in the larger, oblong leaves. The collections, Wray 3397 and Henderson 29542, have the scales on the undersides of the leaves .5–1 mm. wide, but Derry 2731 has much larger scales 1.5–2 mm. wide—larger even than in the coarsely scaly forms which I refer to typical *D. testudinarum*.

Malayan collections:—

Kelantan—SFN 29542 (Henderson) (in fruit).

Perak—Derry 2731, Wray 3397 (type).

There remains the problem of how to classify Kunstler 7497 (Perak) and it, I confess, baffles me. Identical with

it are C.F. 0127 (Kuala Kangsar, Perak) and C.F. 5621 (Matang, Perak). They have the long staminal column of *D. testudinarum*, the large leaves of var. *macrophyllus* but, according to Kunstler's field note, the white flowers of *D. oblongus*. I believe that they should be referred to *D. oblongus* but clearly we do not know enough about these wild durians to be able to classify them satisfactorily.

D. testudinarum var. **pinangianus** Becc.

Malaysia III, *1886*, p. 246.

Synonym:—

D. pinangianus Ridley, Fl. Mal. Pen. 1, *1922*, p. 264.

There are eight sheets of the type-collection, Curtis 293, at Singapore and several more recent collections. The variety differs from typical *D. testudinarum* in its smaller, lanceolate leaves, its smaller flowers and, it seems, in its seeds wholly covered by the aril but this point needs confirmation from fresh material. On the size of the flowers and leaves it cannot be separated specifically from *D. testudinarum* because the collection, Haniff 3700, has leaves more like var. *pinangianus*, so that it bridges the difference.

The following are the distinctive characters of the variety:—

Leaf-blade 6–14 ×1½–4 cm., lanceolate: petiole .8–1.5 cm. long. Flowers smaller with slender pedicels 2–6 cm. long: petals 6 cm. long, scaly on the outside: stamens 5–6 cm. long overall, the tube of the phalanges 3 cm. long.

Collections:—

Penang—SFN 3328, 3339 (Burkill),: Curtis 293 (type): ? Haniff 3700.

Perak—Ridley 9572.

D. lanceolatus Masters

Journ. Linn. Soc. Bot. XIV, *1875*, p. 499.

Ridley referred his collection, 15595 (Selangor), to this species. The flowers, however, are too rudimentary for identification. Considering, too, the variation and scaliness of the leaves of *D. testudinarum* and its varieties, I think the record of *D. lanceolatus* from Malaya should be deleted for the present.

ELAEOCARPUS

The following key covers 31 Malayan species. Of these, *E. grandiflorus* and *E. hainanensis* are added to the flora for the first time and **E. cruciatus, E. pseudopaniculatus** and **E. longifolius** var. **fusiformis** are described as new. The following changes in specific epithets are made: *E. nitidus* Jack for *E. parvifolius* Wall., *E. palembanicus* (Miq.) for *E. Hullettii* King and *E. leptomischus* Ridley, *E. littoralis* Kurz for *E. obtusus* Bl. sensu King, and *E. ferrugineus*

(Jack) Wall. for *E. Jackianus* King. The following new names are proposed:—**E. nanus** nom. nov. for *E. reticulatus* Ridley, and **E. recurvatus** nom. nov. for *E. ferrugineus* (Wight) Beddome (an Indian species). The position of *E. eriobotryoides* is changed by transfer from Acronodia to the pentamerous group. *E. macrocarpus* Ridley is reduced to *E. robustus*, *E. leptomischus* Ridley to *E. palembanicus*.

I have no doubt that several more species are to be added to the Malayan flora, especially from the mountainous regions. There is also much to be learnt of the relation between the Malayan species and those of Sumatra, Borneo and the Philippines. Indeed, the genus is in need of critical revision by a botanist well-acquainted with the plants in the forest. I believe that several species such as *E. stipularis*, *E. floribundus* and *E. robustus* are much more variable than has been supposed, so that many synonyms may be discovered.

The subdivision of the genus is unsatisfactory, except for the subgenus Acronodia which seems to be a natural group with tetramerous flowers and male and monœcious individuals. I doubt if the number of cavities in the ovary is constant enough to define the subgenera exactly because *E. stipularis*, for instance, has 3 or 5 loculi, though generally five, and *E. palembanicus* has 2 or 3, though generally 2. Likewise with the awn on the anther, because *E. littoralis* has long awns and *E. cruciatus*, which is allied with it, is awnless. Features that are commonly overlooked, yet must be useful in diagnosis, are whether the buds are resin-coated or not and whether the petioles are geniculate or not. To these I would add also the colour of the withering leaves.

It seems that in most Malayan species the leaves habitually wither red. For example, with reddening leaves, there are *E. floribundus*, *E. ferrugineus*, *E. sphaericus* *E. Mastersii*, *E. nanus*, *E. nitidus*, *E. palembanicus*, *E. paniculatus*, *E. petiolatus*, *E. polystachyus*, *E. pseudopaniculatus*, *E. robustus*, *E salicifolius*, and *E. stipularis*. I have seen a very few individuals of *E. petiolatus*, *E. nitidus*, *E. Mastersii* and *E. robustus* with yellowing leaves, but they are exceptional. On the other hand, I have found that *E. littoralis* and *E. rugosus* var. *singaporensis* have always yellowing leaves. The leaves of *E. pedunculatus* in Singapore (about 20 trees) turn yellow but those of four trees which I observed in Penang turned red. On six trees of *E. Griffithii*, which I have observed in Johore, the leaves turned yellow: and, if yellowing is typical of the species, then that is the easiest way of distinguishing it from living trees of *E. palembanicus* and *E. paniculatus*, to which it is very similar.

Important, too, I think, in the classification of the species should be the manner of branching. In all the habit is that of Terminalia in some degree but much more pronounced in some species than in others. Thus the habit is very pronounced in *E. littoralis, E. pedunculatus, E. rugosus, E. cruciatus, E. ferrugineus* and *E. sphaericus;* in other words, in those species which have more or less obovate leaves.

I append also a list of corrected identifications of the Malayan collections which have been distributed in previous years.

KEY TO THE MALAYAN SPECIES OF ELAEOCARPUS

Tetramerous Group:—

Flowers 4–merous, scarcely opening; some plants with male flowers, others with bisexual flowers; *petals* small 4–7 mm. long, entire or with a few teeth at the apex only, the edges generally incurved; *anthers* mostly without awns; *ovary* 2–celled; *fruit* oblong, the stone smooth, slightly verrucose or finely hairy.

Pentamerous Group:—

Flowers 5–merous, generally opening wide, often large, always bisexual; *petals* generally deeply fimbriate or toothed: *anthers* in many species awned; *ovary* 2–5 celled; *fruit* round or oblong, often large, the stone often rugose, tuberculate, reticulate or spinous.

Section A:—ovary and *fruit* with 5 cavities; *petals* divided for half their length into fimbriae; *anthers* without awns; *fruit* round, the stone with a very thick rugose-verrucose wall.

Section B:—ovary and *fruit* with 3 cavities; *petals* divided for a third to a half their length into fimbriae; *anthers* mostly without awns; *ovary* hairy; *fruit* round or oblong, the stone various.

Section C:—ovary with 2 cavities; *petals* densely silky, generally divided into fimbriae only in the distal third or quarter; *anthers* in most species awned; *fruit* with 1–2 cavities, the stone various.

Tetramerous Group

Twigs and petioles brown velvety or tomentose
- Leaves large, 5–12 cm. wide, with 8–11 pairs of brown-velvety side-veins .. .. *E. ferrugineus*
- Leaves small, 3–6 cm. wide, soon glabrous, with 5–7 pairs of side-veins; mountains .. *E. glabrescens*

Twigs and petioles finely silky or glabrous
- Racemes 8–20 cm. long; *petals* 5–7 mm. long, silky on both sides, entire or with a few teeth; *leaves large* 4–10 cm. wide, with 7–10 pairs of side-veins; *buds* resinous
  - Twigs finely silky hairy; *buds* thinly resinous; *lamina* generally toothed; *petiole* 4–10 cm. long; *petals* densely hairy; *anthers* not awned; *fruit* 2 cm. long; generally lowland .. .. *E. polystachyus*
  - Twigs glabrous; *buds* resin-coated; *lamina* entire; *petiole* 1.8–5.5 cm. long; *petals* thinly hairy; *anthers* with a distinct short awn; *fruit* 1.4–1.6 cm. long; mountains .. *E. pseudopaniculatus*

Racemes up to 5 cm. long; *petals* 4–5 mm. long, more or less glabrous on the inner face; *fruit* 1–1.5 cm. long; *petiole* less than 4 cm. long; *side-veins* 5–10 pairs; *buds* very slightly resinous or not so

Leaves very coriaceous, pointing down, 4–12 × 2–5 cm.; *petals* thinly silky outside, glabrous inside; G. Tahan .. .. *E. reticosus*

Leaves not or only thinly coriaceous, up to 10 × 4 cm.

Leaves pointing down, acuminate, with 5–8 pairs of side-veins, thin; *petals* nearly or quite glabrous; lowland and mountain tree .. .. *E. Mastersii*

Leaves pointing up, coriaceous, rather small, subacuminate or often rather blunt, with 7–12 pairs of side-veins; *petals* densely silky-hairy outside, slightly hairy or glabrous inside; bush of mountain tops or ridges .. *E. nanus*

Pentamerous Group

Section A

Leaves softly hairy on the underside; *stipules* generally conspicuous, large, toothed .. *E. stipularis*

Leaves glabrous; *stipules* absent or minute

Leaves oblong-lanceolate with short stalks 4–14 mm. long; *petals* 10–15 mm. long; *anthers* almost sessile .. .. *E. sphaericus*

Leaves elliptic, acuminate, with stalks 16–30 mm. long; *petals* 3–4 mm. long; *anthers* stalked .. .. *E. nitidus*

Section B

Leaves softly hairy beneath; *stipules* generally conspicuous, large, toothed; *fruit* round .. *E. stipularis*

Leaves soon glabrous, at most finely sericeous beneath

Buds thinly coated with resin; *racemes* 5–8 cm. long; *petals* densely hairy on the inside, with incurved sides and short fimbriae; *anthers* with a rather long awn; *fruit* 13–15 mm. long, oblong, blunt; *lamina* small, up to 13 × 5 cm.; twigs and petioles slender .. *E. palembanicus*

Not so; *buds* silky; *anthers* often with a tuft of hairs

Leaves lanceolate; *racemes* 4–8 cm. long; *side-veins* 5–8 pairs

Lowland tree, Singapore, Johore, E. Pahang; *leaves* 1.5–2.5 cm. wide, thin; *petals* glabrous or slightly hairy, 4 mm. long; *fruit* round, 2 cm. wide .. .. .. *E. salicifolius*

Mountains, G. Tahan; *fruit* ? oblong; *petals* 5–6 mm. long

Lamina small, 6–9 cm. long, pustulate when dry, thin; *petals* glabrous; *anthers* with a few, rather long apical hairs .. *E. tahanensis*

Lamina 11–15 cm. long, leathery; *petals* finely hairy on the edge and inside; *anthers* subsessile, with a few, very short hairs at the apex .. .. *E. eriobotryoides*

Leaves elliptic; *racemes* often longer

Lamina large, 5–13 cm. wide; *petiole* 4–9 cm. long; *side-veins* 8–14 pairs; *raceme* 8–16 cm. long; *fruit* broadly oblong to subglobose, 4–6 cm long .. *E. robustus*

Not so; side-veins 3–8 pairs

Mountains; *lamina* ovate-elliptic; *petals* finely silky on the inside; *anthers* without apical hairs; *fruit* large, oblong or subglobose, 2.7–3 × 2.5 cm. .. .. *E. Wrayi*

Not so

Lamina elliptic, acute, with 3 pairs of side-veins; *anthers* with long awns; Johore .. *E. acmosepalus*

Not so; side-veins more numerous; *anthers* not awned, but with hairs at the apex

Lamina obovate, with 4–5 pairs of side-veins, small 6–10 × 2.5–5 cm.; *petals* glabrous; *anthers* with several long hairs at the apex; *fruit* oblong 2.5 × 1.3 cm., blunt .. *E. Barnardii*

Lamina elliptic or ovate, acuminate

Petiole 1–2 cm. long; *lamina* narrow, 2–3.5 cm. wide; *petals* densely hairy on the inside; *anthers* with an apical tuft of long hairs; *fruit* fusiform, 2.5–3.7 cm. long; S. Pahang *E. longifolius* var. *fusiformis*

Petiole 2–6 cm. long; *lamina* 4–7.5 cm. wide, often pimply when dried; *sepals* often pimply; *petals* glabrous except the hairy edges; *racemes* 4–15 cm. long; *anthers* with an apical tuft of very short hairs; *fruit* 2–3 cm. long .. *E. floribundus*

Section C

Racemes generally many-flowered with small, rather shortly pedicellate flowers; *petals* 7–9 mm. long, appearing oblong from the incurved edges, not expanded at the apex; *fruit* 12–20 mm. long, oblong, glabrous, ripening grey-blue; *buds* resin-coated; *twigs* glabrous, medium to slender; *lamina* elliptic (except in *E. pedunculatus*)

Racemes more than 15 cm. long; *petals* with a few short obsolete teeth or none; *anthers* clothed with long silky hairs and with a long outcurved awn; *ovary* sparsely to densely silky .. .. .. *E. paniculatus*

Racemes 6–15 cm. long

Leaves generally more than 6 cm. wide; *buds* very resinous; *petals* with many fimbriæ; *anthers* finely and shortly hairy with a straight awn; *ovary* glabrous .. *E. petiolatus*

Leaves generally less than 6 cm. wide: buds thinly or slightly resinous

Leaves obovate, generally crowded on thickened twigs, generally toothed; *petals* with many fimbriæ; *anthers* with a short outcurved point, scarcely awned, not silky; *ovary* glabrous .. *E. pedunculatus*

Leaves elliptic or ovate elliptic, almost or quite entire; *twigs* slender; *ovary* more or less hairy

Raceme 8–13 cm. long; *petals* 7–8 mm. long, with a few obsolete teeth at the apex; *anthers* with long silky hairs and an outcurved awn; *ovary* sparsely silky .. *E. Griffithii*

Raceme 5–8 cm. long; *petals* 4–5 mm. long, with many fimbriæ; *anthers* with a rather long awn, not silky hairy; *ovary* densely hairy .. .. .. *E. palembanicus*

Racemes with a few (3–10), large flowers or the flowers with long pedicels; *petals* 9–22 mm. long, flat, more or less cuneate, expanded and often bifid at the dentate or fimbriate apex; *fruit* more than 20 mm. long; *buds* generally not resin-coated; *twigs* silky or glabrous, generally stout; leaves lanceolate or obovate

Lamina lanceolate or narrowly elliptic, 2–5 cm. wide, with 10–13 pairs of side-veins; *petals* bifid and fringed with many narrow fimbriæ; *anthers* with long awns; *fruit* fusiform, the stone set with spinous fibres

Buds and twigs finely silky; *lamina* thin; *petiole* 1–3 cm. long, geniculate; without persistent large bracts .. .. *E. grandiflorus*

Buds and twigs glabrous (? thinly resinous); *lamina* distinctly coriaceous; petiole .5–1.5 cm. long, (? not geniculate); *raceme* with large persistent bracts .. .. .. *E. hainanensis*

Lamina elliptic, obovate or blunt, more than 5 cm. wide; *petals* not or obscurely bifid, with rather few large teeth; *fruit* oblong or rounded not fusiform, the stone rugose, tubercled or reticulate

Petiole not geniculate; *racemes* 5–10 cm. long

Lamina with 7–10 pairs of side-veins, blunt, narrowly elliptic, obovate; *petiole* 1–4 cm. long; *buds* finely

silky; *racemes* 3–6 flowered; *pedicels* 2–4.5 cm. long; *petals* 16–22 mm. long, with 9–15 teeth; *anthers* with awns 3–5 mm. long; *fruit* elliptic oblong; with stilt-roots and pneumatophores; freshwater tidal swamps .. .. .. *E. littoralis*

Lamina with 10–16 pairs of side-veins; *racemes* 10–16 flowered; *pedicels* 1–2.5 cm. long

Lamina blunt, elliptic, very leathery; *petiole* 2.5–5 cm. long; *petals* 13 mm. long, with 5–6 teeth; *anthers* without awns; *fruit* oblong; *twigs* glabrous; *buds* resin-coated; mountains .. *E. cruciatus*

Lamina pointed, lanceolate-obovate, gradually tapered to the very short stalk, the base abrupt; *petiole* 2–10 mm. long; *twigs* very stout, hairy, the buds scarcely resinous; *petals* 13–17 × 6–9 mm., with 11–18 teeth; *anthers* with awns 2 mm. long; fruit 3 cm. long, subglobose; lowland .. .. *E. apiculatus*

Petiole geniculate; *lamina* obovate, bluntly acuminate or blunt, with 8–14 pairs of side-veins; *racemes* 8–15 cm. long, with 6–10 flowers; *pedicels* .7–2.5 cm. long; *anthers* with short awns .5–1.5 mm. long; *fruit* rounded-oblong; *buds* and twigs silky hairy; midrib and petiole hairy, weathering glabrous

Petals 10–22 mm. long, with 7–14 teeth; *leaf-base* gradually attenuate; *petiole* 1–3 cm. long; *anther-awn* 1–1.5 mm. long .. .. *E. rugosus*

Petals 8–10 mm. long, with 6–8 teeth; *leaf-base* tapered but suddenly rounded at the base; *anther-awn* .5–1 mm. long .. .. *E. Kunstleri*

KEY TO THE MALAYAN SPECIES OF ELAEOCARPUS ON VEGETATIVE CHARACTERS

Leaves lanceolate or small, generally pointed

High mountain plants

Lamina 11 cm. or more long, coriaceous, serrate, side-veins 6–8 pairs .. .. *E. eriobotryoides*

Lamina less than 11 cm. long

Leaves coriaceous, upstanding, with 7–12 pairs of side-veins .. .. *E. nanus*

Leaves at most thinly leathery; side-veins 5–7 pairs

Twigs finely silky; lamina thinly leathery with close subparallel veinlets .. .. .. *E. Mastersii*

Twigs glabrous; lamina with rather loosely reticulate veinlets, pustulate when dried .. .. *E. tahanensis*

Lowland plants; leaves not or scarcely coriaceous
Side-veins 9–13 pairs
Buds glabrous; lamina thinly coriaceous; petiole .5–1.5 cm. .. .. *E. hainanensis*
Buds finely silky; lamina thin
Petiole .5–1.5 cm. long; lamina slightly obovate-lanceolate .. .. *E. sphaericus*
Petiole 1–3 cm. long; lamina narrowly elliptic .. .. .. *E. grandiflorus*
Side-veins 5–9 pairs; petiole 1.5–2.5 cm. long
Young leaves silvery silky; buds not resinous .. .. .. *E. salicifolius*
Not so; bud-scales thinly cemented with resin; lamina narrowly elliptic .. *E. Mastersii*
(compare also *E. longifolius* from S. E. Pahang)

Leaves elliptic or large

Buds resinous
Twigs very stout; leaves very leathery, blunt, with 10–14 pairs of side-veins; mountains .. *E. cruciatus*
Twigs slender or medium; leaves more or less pointed, thin
Leaves narrowly elliptic-obovate, often blunt, with 6–9 pairs of side-veins .. *E. pedunculatus*
Not obovate, always pointed
Mountains; lamina 8–14 × 4–7.5 cm., rather ovate-elliptic; petiole 1.8–5.5 cm.; side-veins 6–9 pairs .. .. *E. pseudopaniculatus*

Not so, generally lowland
Lamina generally less than 6 cm. wide
Twigs finely adpressedly hairy; bud-scales slightly glued with resin .. *E. Mastersii*
Twigs glabrous; buds capped with resin
Leaves withering yellow; common .. .. .. *E. Griffithii*
Leaves withering red; rather rare .. .. .. *E. palembanicus*
Lamina generally more than 6 cm. wide
Leaf generally toothed; twigs finely hairy .. .. .. *E. polystachyus*
Leaf entire; twigs glabrous
Leaves pointing down up to 15 cm. wide, rather broadly elliptic .. *E. petiolatus*
Leaves pointing up, up to 8 cm. wide, narrowly elliptic .. *E. paniculatus*
Buds not coated with resin
Leaves obovate or blunt
Leaves small, 6–10 cm. long, pointed, with 4–5 pairs of side-veins; twigs and petioles slender .. .. *E. Barnardii*
Leaves larger with more numerous side-veins; twigs stout
Petiole not geniculate
Blade generally blunt, with 7–10 pairs of side-veins; petiole 1–4 cm. long .. .. *E. littoralis*

Blade lanceolate-obovate, pointed with 14–16 pairs of side-veins; petiole .2–1 cm. long; .. *E. apiculatus*
Petiole geniculate; lamina obovate or large, up to 14 cm. wide
Lamina gradually narrowed to the petiole .. .. *E. rugosus*
Lamina attenuate downwards but abruptly rounded at the base .. .. .. *E. Kunstleri*
Leaves elliptic or ovate, pointed
Twigs ferruginous-tomentose
Lamina with the veins tomentose beneath, up to 12 cm. wide .. .. *E. ferrugineus*
Lamina soon glabrous, up to 5.5 cm. wide; mountains .. .. .. *E. glabrescens*
Twigs glabrous or with colourless hairs
Twigs and undersides of the leaves velvety; stipules large, dentate .. .. *E. stipularis*
Not so
Leaves ovate-elliptic, leathery; high mountains
Leaves very leathery; twigs soon glabrous .. .. .. *E. reticosus*
Leaves less leathery; twigs for a long while silky .. .. *E. Wrayi*
Leaves at most thinly leathery
Lamina large 13–26 × 6–12 cm., with 8–14 pairs of side-veins .. *E. robustus*
Lamina smaller or with fewer veins
Leaves generally pustulate when dried; venation lax .. *E. floribundus*
Not so
Leaves narrowly ovate-elliptic, generally rounded at the base, S. E. Pahang .. .. *E. longifolius* var. *fusiformis*
Leaves cuneate at the base
Twigs and petioles for a long while silky hairy .. *E. nitidus*
Twigs and petioles soon glabrous; bud-scales generally slightly glued with resin .. *E. Mastersii*

Classification of Elæocarpus according to the Stone of the Fruit

Stone 1.5–4 cm. wide, round, thick-walled, more or less deeply rugose-verrucose, with 2–5 radial cavites.
E. nitidus, E. robustus, E. salicifolius, E. sphaericus, E. stipularis, E. Wrayi.
Stone large, more or less flattened or keeled, strongly rugose-reticulate, with 1–2 transverse cavities.
E. apiculatus, E. cruciatus, (*E. Kunstleri* ?), *E. littoralis, E. rugosus.*
Stone more or less fusiform.
Stone set with spinous fibres:—*E. grandiflorus, E. hainanensis.*
Stone longitudinally rugulose:—*E. Barnardii, E. longifolius* var. *fusiformis.*
Stone smooth, with 3 shallow longitudinal grooves, rather broad:—*E. floribundus.*

Stone ellipsoid or ovoid with 1 cavity, often with a faint keel along two sides and over the narrower end.
Stone densely covered with fine radiating hairs:—*E. ferrugineus, E. polystachyus, E. palembanicus.*
Stone with few or no radiating hairs.
Stone smooth or slightly uneven:—*E. glabrescens, E. Mastersii.*
Stone rugulose or verruculose:—*E. Griffithii, E. palembanicus* (stone rather densely hairy, see above), *E. paniculatus, E. pedunculatus, E. petiolatus, E. pseudopaniculatus, E. reticosus, E. nanus.*

E. acmosepalus Ridley
Journ. Str. Br. R. As. Soc. 75, *1917*, p. 8.

No syntypes of this are in the Singapore Herbarium, namely Cantley (Pengerang, Johore), Beccari 3433 (Sarawak) and Haviland 2035 (Sarawak). But the collection "Ulu Rompin (Watson)", (= C.F. 4151), referred to the species in the Fl. Mal. Pen. I, p. 315, is in the Singapore Herbarium and it does not agree at all well with Ridley's original description, so that I am convinced that it has been wrongly identified.

E. acmosepalus, if Ridley's description is correct, should be remarkably distinct in having only 3 pairs of lateral veins to the leaf, and the long awns on the anthers tipped with hairs. Watson's collection 4151 has 6 pairs of lateral veins and awnless anthers. I identify it with *E. longifolia* Bl. in the absence of a better 'match'. There is no species in the Singapore Herbarium agreeing with *E. acmosepalus* as defined originally. The description of the fruit, in the Fl. Mal. Pen., refers to Watson's collection and is therefore wrong.

The best agreement with E. *acmosepalus* is afforded by the collections C.F. 4120 and SFN 33969 which I refer with misgiving to *E. floribundus*. They have narrow leaves with 5–7 pairs of lateral veins and awnless anthers tipped with a small tuft of hair, as in *E. floribundus*.

E. apiculatus Mast.
F.B.I. 1, p. 407.

There are three collections from Perak in the Singapore herbarium which were identified by King as *E. apiculatus*, namely Kunstler 7293, 8085 and 10791. The only recent collection agreeing with them is the Forest Department's 8047, also from Perak.

E. apiculatus, thus interpreted, is very close to the Philippine *E. monoceras* which differs in having shorter flower-pedicels 3–15 mm. long (1–2.5 cm. in *E. apiculatus*), the inner face of the petals glabrous (densely sericeous on both faces in *E. apiculatus*), the stamens with longer, 3 mm. awns and shorter, .5–1 mm. filaments (2 mm. in *E. apiculatus*), and the disc set with long almost chaffy hairs

(shortly sericeous in *E. apiculatus*). Further collections may show that these distinctions are not constant.

From *E. rugosus*, as I interpret it, *E. apiculatus* differs in its short, not geniculate petiole and its abruptly terminated, decurrent leaf-base, the more numerous flowers on the raceme, the slightly longer awn and shorter filament of the stamen and the more coarsely tuberculate stone of the fruit.

However, as remarked under *E. rugosus*, the position of these closely allied species is far from satisfactory.

E. cruciatus nov. spec.

Ramulis crassis, apicem versus dense resinosis, glabris.

Laminis 11–22 × 5–10 cm., anguste vel late ellipticis, *obtusis*, saepe subretusis, *distanter denticulatis, valde coriaceis*, glabris, costis lateralibus utrinsecus 10–14, interstitiis valde reticulatis: *petiolis* 2.5–5 cm. longis, crassis, apici *haud geniculatis.*

Racemis 6–10 cm. longis, paucifloris, *glabris, bracteis caducis:* pediculis florum 1.5–2 cm. longis, glabris: *sepalis* 5, 12–13 mm. longis, lanceolatis, *glabris:* petalis 5, 13 mm. longis, 4–5 mm. latis, *anguste spathulatis*, tenuibus, *utrinque sericeis*, externe apicem versus glabris, *dentibus* 5–6 *brevibus* (1–2 mm. longis) *praeditis*, haud bifidis: *staminibus* ca. 30–40, filamentis 3–4 mm. longis, *antheris* 4–5 mm. longis *minute puberulis, nec aristatis nec piloso-cristatis* sed apice loculi externi recurvato: *ovariis densissime pilosis*, 2–loculatis.

Fructibus 3–3.5 cm. longis, oblongis, pubescentibus; putaminibus 25 × 18 × 12 mm., compressis, rugoso-tuberculatis, 4–alatis, alis crassis obtusis, sectione transverse cruciatis.

Distrib. Malaya, in silvis montanis, 1300 m. alt.

Collect.:—

SFN 8570 (Burkill et Holttum), Fraser's Hill, Pahang Sept. 1922.

C.F. 22357, Fraser's Hill, Pahang, 17.6.30: *typus.*

The stout resinous twigs, blunt leathery leaves with straight petiole, the large pentamerous flowers with few teeth to the petals and the simple anthers distinguish this mountain tree. It seems most nearly allied with *E. littoralis*, the twigs of which are never resinous, the anthers of which have long awns, and the habitat of which, in tidal rivers, is very different. *E. grandiflorus* has smaller, pointed leaves, multidenticulate bifid petals, aristate anthers and spinous, not winged or ridged, putamen, though it is certainly allied.

E. eriobotryoides Ridley

Journ. F.M.S. Mus. V, *1913*, p. 29.

As originally described, the flowers were said to be pentamerous. In the Fl. Mal. Pen. vol. I, p. 320, however, Ridley placed the species in the section Acronodia and described the sepals as 4. There is a specimen of the type-collection at Singapore (H. C. Robinson, Gunong Mengkuang, Selangor, 18.1.13) and it has distinctly pentamerous flowers with trilocular ovary.

The species is close to the specimens of *E. Wrayi* from G. Tahan, but more collections and fruiting specimens are needed to establish its specificity.

E. ferrugineus (Jack) Steudel

Nomencl., *1840* p. 545.

Basinym:—*Monocera ferruginea* Jack Mal. Misc. 1, *1820*, p. 44.

Synonym:—*E. jackianus* King, Mat. Fl. Mal. Pen. 1, *1891*, p. 247.

Homonyms:—*Monocera ferruginea* Wight, lc. t. 205, *1840*.

E. ferrugineus (Wight) Beddome, Fl. Sylv. *1869*, pl. 112.

In the Index Kewensis, *M. ferruginea* Jack and *M. ferruginea* Wight are confused, though they belong to different sections of the genus. King distinguished Jack's species from the Indian and gave it a new name reserving *E. ferrugineus* for the Indian. In this he was wrong because thirty years previous to the publication of *E. ferrugineus* (Wight) Beddome, Steudel had made the combination *E. ferrugineus* (Jack).

Accordingly, the Indian species must have a new name for which I propose **E. recurvatus** in view of Gamble's note "The characteristic of the curiously folded back leaves makes this interesting tree easily recognizable" (Fl. Madr. 1, p. 124).

That the plants described by King and subsequent authors as *E. jackianus* are the same as *M. ferruginea* Jack there can be no doubt. Only one other species of Elæocarpus in Malaya has such "ferruginously villous" twigs, namely *E. glabrescens* but it has glabrous leaves much smaller than those described by Jack.

E. floribundus Bl.

I think this is a variable and much more widely spread species than has been supposed. *E. tahanensis* is probably only a variety and so, too, probably are the collections C.F. 4120 and SFN 33969. These two collections differ from *E. floribundus* in their almost entire lanceolate or lanceolate-elliptic leaves (8–18 × 2.7–6 cm.), which are scarcely pustulate when dried or not at all, and in their fusiform fruit. Their floral structure and venation are identical with that of *E. floribundus*. Still, I am uncertain that they are not an undescribed species or, even, *E. acmosepalus*.

E. grandiflorus Sm.

Rees' Cycl. n.5. *(1819)*.

Buds and twigs finely adpressed silky hairy, not resin-coated.

Leaf-blade 6–16 × 2–5.5 cm., *narrowly elliptic or lanceolate-elliptic*, thin, simply pointed or narrowed to a rather blunt apex, *the base cuneate and slightly decurrent on the petiole*, the edge slightly crenate-toothed, *sparsely and finely adpressedly sericeous on the underside*, more so on the main veins

and petiole, becoming glabrous, upperside glabrous, *with 10–13 pairs of side-veins:* petiole 1–3 cm. long, geniculate at the apex, finely adpressedly sericeous becoming glabrous.

Raceme 4–6 cm. long, *3–6 flowered, the flowers corymbose,* sparsely sericeous or nearly glabrous, mostly from the lower leaf-axils: *bracts small, caducous: pedicels* 1.5–2.5 cm. long, (red): sepals 11–13 mm. long, finely and sparsely sericeous (red): *petals* 12–14 mm. long, 6–9 mm. wide at the apex, cuneate, *bifid* for about ¼ the length, each lobe with 6–14 short teeth, 1–3 mm. long, or each lobe obscurely bifid itself, *adpressedly sericeous on both faces,* glabrous towards the teeth: *stamens* ca. 40, with short filaments 1 mm. long, anthers 3–4 mm. long, and awns 2–3 mm. long, the anthers very minutely adpressedly hairy: *disc* hairy with 5 indistinctly separated lobes: *ovary 2–celled,* hairy.

Fruit 3 cm. × 1.5 cm., *fusiform elliptic,* 1–celled; *the stone spindle-shaped, set with short often recurved spinous processes,* 2–3 mm. long, extending into the pulp.

Cochin-China, Burma, Siam, Java, Malaya.

Collections:—

KEDAH; C.F. 21501, Ulu Muda Reserve.

SELANGOR; C.F. 11161, Ginting Simpak.

PAHANG; C.F. 37509, Cameron Highlands, alt. 1300 m.

Except the fruit, this description is based on the Malayan specimens. It seems that they have smaller flowers than typical of the species so that they might be called var. *parviflora* but I find very few measures of the size of the flower. Pierre (Fl. For. Cochinch. pl. 142) gives the sepals 22 mm. long, the petals 21 mm. long, and stamens 12 mm. long (anthers 5 mm., awn 3–4 mm. filament 3 mm.). Kurz (For. Fl. Burma I, p. 166) gives the sepals as 7 lines (ca. 15 mm.) long and the petals somewhat longer. The figure in the Bot. Mag. (t. 4680) shows the petals about 18 mm. long. On the other hand Koorders and Valeton give the anthers as 4 mm. long and the awn as 2.5 mm., which figures agree with the Malayan collections, (Bijdr. Booms. Java, 1, p. 244).

Koorders and Valeton state that the pedicels and sepals are red, as shown in the Botanical Magazine. So this species should be easy to recognise in the forest when in flower.

The ovary is 2-celled, not 3-celled as stated by Gagnepaine (Fl. Gen. Indoch. 1, p. 568).

E. hainanensis Oliver

Hook. Ic. 2462, *1896.*

Very like *E. grandiflorus* Sm. but:—

Buds, twigs, leaves and racemes entirely glabrous, or the buds sparsely adpressedly hairy, *the buds thinly resinous.*

Lamina 7–15 × 2–4.5 cm., lanceolate-elliptic, *distinctly but not strongly coriaceous,* tapered very gradually into the shorter, scarcely if at all geniculate, petiole .5–1.5 cm long· (lat. veins 9–12 pairs).

Racemes with more or less persistent oblong-ovate, blunt, finely denticulate, leafy bracts 6–18 × 2–7 mm.: *pedicels* 1.5–3 cm. long: *sepals* 12–13 mm., more or less glabrous: *petals* 13–15 mm., 9–10 mm. wide: *ovary* adpressedly pubescent.

Fruit narrowly fusiform, 3 × 1.2 cm. (stone 25 × 6 mm.). S. China, ? Indo-China, N. Malaya.

Collections:—

KEDAH; C.F. 10065 (Sungei Sok), 21717 (S. Muda).

These two Malayan collections are exactly intermediate between *E. hainanensis* and *E. rivularis* as described by Gagnepain (Fl. Gen. Indoch. 1, p. 567). They have the large broad bracts of *E. hainanensis* but the hairy ovary and bifid petals of *E. rivularis*. The division of the petals and the shape and size of the bracts vary considerably in the Malayan collections so that I am doubtful whether *E. hainanensis* and *E. rivularis* are different species. *E. Lacei* Craib (Kew Bull. *1925*, p. 23) seems also identical with *E. hainanensis*, which is the oldest of the three names. That a "Chinese" species should occur in the north of Malaya is not remarkable because *E. hainanensis* is probably a species of the Burmese-IndoChinese monsoon-forest which extends into South China and the northern states of Malaya.

E. hainanensis is so very closely allied with *E. grandiflorus*, having the same raceme, floral structure and fruit, that it may well be considered a variety c.f. *E. grandiflorus* var. *rivularis* Pierre mss. *E. Lacei* is said to have red sepals like *E. grandiflorus*.

E. littoralis Kurz.

Journ. As. Soc. Bengal 43, *1874*, p. 132.

Synonym:—

E. obtusus Bl. sensu King, Mat. Fl. Mal. Pen. 1, *1891*, p. 244.

As pointed out by Koorders and Valeton (Exc. Flora v. Java II, p. 570), King wrongly referred the Malayan specimens to *E. obtusus* Bl. which differs from *E. littoralis* in its pointed leaves, shortly awned anthers, multidenticulate petals (20–25 teeth: 8–15 in *E. littoralis*) and mountainous habitat. Hence our Malayan specimens have been consistently misnamed.

The authorship of *E. littoralis* is generally attributed to Teysmann and Binnendijk, but these authors never published a description of the species. Kurz first published the name validly and referred to it only the Burmese plant. Therefore one must take Kurz's Burmese plant as the type of *E. littoralis*. It is important that this should be realised because King denied that *E. littoralis* Kurz was the same as *E. littoralis* T. and B. ined.

E. longifolius Bl.

emend. Koorders et Valeton, Bijdr. Booms. v. Java V, *1900* p. 416.

var. **fusiformis** var. nov.

A typo differt petalis minus divisis, laciniis 12–20 praeditis, intus pilis longis sericeis dense hispidis: fructibus fusiformibus, longe apiculatis, 25–37 × 9–10 mm., putamine fusiforme, longitudinaliter rugoso.

Typus:—Forest Department 4151, leg. J. G. Watson, flum. Rompin, Pahang, 2.8.19.

Buds adpressedly silky, not resin-coated: twigs soon glabrous, slender.

Leaf-blade up to 10 × 3.5 cm., *narrowly ovate-elliptic or elliptic,* shortly tapered to a blunt or subacute apex, *the base rather broadly cuneate or almost rounded,* the edge slightly crenate-toothed, thin, glabrous, with 5–7 pairs of lateral veins: *petiole* 1–2 cm. long, geniculate at the apex, practically glabrous.

Racemes 5–8 cm. long, from the leaf-axils, puberulous, many-flowered: *pedicels* .5–1 cm. long, finely puberulous; *bracts* deciduous, minute: *sepals* 6 mm. long, thinly adpressedly puberulous: *petals* 6–7 mm. long, *divided to the middle into about 15 laciniae, glabrous externally but densely chaffy with rather long hairs on the inside and on the edges: stamens* as in *E. floribundus but with a tuft of long hairs at the tip of the anther: ovary hairy,* 3–celled, *soon becoming fusiform in the* young fruit.

Fruit 2.5–3.7 cm. long, 9–10 mm. wide, fusiform pointed; the stone longitudinally rugulose, (not spinous) 25–30 × 6–7 mm.

MALAYA:—

Collections—

PAHANG; C.F. 3186, 4151, 15601 (all from the Rompin River).

Because these Pahang collections are so obviously allied with the Javanese *E. longifolius,* which is reported from Borneo, and because the differences do not seem to me of great importance compared with the resemblances, I prefer to regard them as a variety of *E. longifolius.* In leaf only, the Pahang specimens greatly resemble *E. Griffithii, E. palembanicus* and *E. pseudopaniculatus* but the silky buds distinguish them.

The type-collection of var. *fusiformis* was referred by Ridley to *E. acmosepalus* but, as I have noted under that species, it cannot be considered as such according to the original description of the species.

E. submonoceras Miq. seems closely allied, if not identical.

E. nanus nom. nov.

Synonym:—*E. reticulatus* Ridley, Journ. Str. Br. R. As. Soc. 61, *1912,* p. 2. haud *E. reticulatus* Sm. in Rees Cycl. XII, n. 6.

As remarked by Ridley some Malayan collections of this species were referred by King to *E. punctatus* Bl. which however is certainly a different species. Ridley overlooked that his name was a homonym. I have proposed the new name for the dwarf or bushy habit of the plants.

E. nitidus Jack.

Mal. Miscell. 1, *1820*, p. 41.

Synonym:—*E. parvifolius* Wall. ex C. Mull., Annot. de fam. Elaeocarp., *1849*, p. 24 (teste auctt.).

This species has been misinterpreted by King in the 'Materials', who referred to it specimens which I consider to be *E. robustus*. From the following considerations I think that there can be no doubt of the correct identification of *E. nitidus*.

The important points in Jack's description are these:—

"Leaves .... 3 or 4 inches long, ovate-lanceolate, acuminate .....

Stipules none .....

Stamina 15 .....

Drupe globose, containing a 5-celled nut .....

Native of Pulo Pinang".

Of Elæocarpus with round, 5-locular fruits in Penang, there are only three species, namely *E. sphaericus*, *E. parvifolius* and *E. stipularis*. *E. nitidus* cannot be the first because *E. sphaericus* has lanceolate or lanceolate-obovate leaves and 30–40 stamens: nor can it be the third because *E. stipularis* has conspicuous stipules and 25–30 stamens. It must therefore be *E. parvifolius* which agrees exactly.

King identified *E. nitidus* with specimens having a 3-locular drupe, leaves 4.5–9 inches long, and 15–35 stamens. These specimens clearly belong to the variable *E. robustus* and cannot be admitted as *E. nitidus* because Jack's description is unquestionably accurate.

E. palembanicus (Miq.)

Basinym:—*Monocera palembanicum* Miq., Fl. Ind. Bat. Suppl. 1, *1862* p. 408.

Synonyms:—

E. Hullettii King, Mat. Fl. Mal. Pen. 1, *1891*, p. 242.

E. leptomischus Ridley, Journ. F.M.S. Mus. V, *1913* p. 30.

Specimens distributed from the Buitenzorg herbarium as *E. palembanicus* agree exactly with the Malayan specimens of *E. Hullettii*, syntypes of which are at Singapore. When the combination *E. palembanicus* was published, I have not been able to find out.

As regards *E. leptomischus*, Ridley described it as tetramerous but the type-specimen in Singapore (H. C. Robinson, Gunong Mengkuang, Selangor, 18.1.13) has pentamerous flowers and is exactly *E. Hullettii*.

I find that the ovary in this species is generally trilocular, though occasionally bilocular as King described. But the hairy, shortly fimbriate petals with incurved edges, the aristate anthers and the resinous buds place it nearer to *E. petiolatus* and *E. Griffithii* than to the other Malayan species in the section with 3-locular ovary.

E. petiolatus (Jack) Wallich

Cat. no. 2673, *1829.*

Basinym:—*Monocera petiolata* Jack, Mal. Misc. 1, *1820,* p. 43.

Synonym:—*E. integer* Masters, Fl. Br. Ind. 1, *1874,* p. 408.

Homonym:—*E. petiolatus* Gray, Bot. U. St. Expl. Exp. 1, p. 203.

In the Index Kewensis, *E. integer* is given as the correct name for this species on account of the homonym, but it was overlooked that Wallich transferred Jack's Monocera to Elæocarpus many years previous to Gray's publication. The validity of Wallich's transfer was pointed out by Koorders and Valeton (Bijdr. Booms. Java, V, *1900,* p. 420).

That the Malayan plants, which King and subsequent authors have identified as *E. petiolatus,* truly represent Jack's *Monocera petiolatus,* there can be no doubt. The only other species to which Jack's description might be considered as belonging would be *E. paniculatus* but the short inflorescence, the toothing of the petals and, evidently, the glabrous ovary, described by Jack, prevent such a possibility.

E. pseudopaniculatus nov. spec.

Ramulis gracilibus, apicem versus resinosis, glabris.

Laminis 8–14 × 4–7.5 cm., ellipticis vel ovato-ellipticis, acuminatis, *margine integro, basi rotundatis vel late cuneatis* abruptis, subcoriaceis, glabris, costis lateralibus utrinsecus 6–9, interstitiis minute et dense reticulatis: *petiolis* 1.8–5.5 cm., gracilibus, glabris, geniculatis.

Racemis 7–15 cm. longis, puberulis vel glabrescentibus: *pediculis* florum .3–1 cm. longis, brevibus: *sepalis* 4, ca. 5.5 cm. longis, lanceolatis, subsericeis vel glabris: *petalis* 4, 5 mm. longis, *marginibus incurvatis, externa sericeis, interne dense piloso-sericeis, apici dentibus 2–4 brevibus inaequalibus praeditis; staminibus* 12–16, filamentis brevibus puberulis, *antheris* 2 mm. longis *glabris arista breve, .3 mm. longa, praeditis: ovariis hirsutis,* 2–loculatis: *discis* 8–lobatis.

Fructibus 14–16 × 10–12 mm., oblongis, glabris.

Habit: Malaya, in silvis montanis ca. 1300 m. alt.

Collect.:—

PERAK; Gunong Batu Puteh, Wray 1223 (det. *E. petiolatus*).

PAHANG; Gunong Tahan, SFN 7977 (Haniff & Nur). Fraser's Hill, SFN 8567 (Burkill & Holttum), SFN 11391 (Nur) (TYPE: det. *E. paniculatus*), SFN 33247 (Corner), C.F. 22499, 22560 (det. *E. paniculatus*).

This species is best described as *E. palembanicus* with tetramerous flowers and long racemes. Systematically it comes nearest *E. polystachyus* from which it is at once distinguished by the entire leaves and glabrous twigs. Sterile specimens can be distinguished from *E. palembanicus* only by subtleties of venation which become apparent on comparing specimens. The shorter inflorescence distinguishes the species most readily from *E. paniculatus.*

E. recurvatus nom. nov.

Synonym:—

E. ferrugineus (Wight) Beddome, Fl. Sylv. *1869*, t. 112.

M. ferruginea Wight, lc. t. 205, *1840*, haud *M. ferruginea* Jack *1820*.

The need for this new name for the Indian species of Elæocarpus I have stated under *E. ferrugineus* (Jack) Steudel.

E. robustus Roxb.

Fl. Ind. II, *1832*, p. 598.

Synonyms:—

E. leptostachyus Wall. ex C. Mull., Annot. de fam. Elaeocarp. *1849*, p. 23.

E. nitidus Jack sensu King, Mat. Fl. Mal. Pen. I, *1891*, p. 237.

E. macrocarpus Ridley, Fl. Mal. Pen. I, *1922*, p. 321.

I am unable to distinguish the specimens identified by King with *E. leptostachyus* and by Ridley with *E. macrocarpus* from those identified by King with *E. robustus*. In leaf-characters and size and structure of inflorescence and flowers they are identical. It is possible, however, that there are varietal differences in the fruit. In typical *E. robustus* it seems that the fruit is 1–1¼″ long and broadly oblong or subglobose, whereas in *E. macrocarpus* it is 1¾–2½″ long and 1½–2¼″ wide. Nevertheless, I am not convinced that the oblong fruits are not an immature state of the larger, subglobose ones. The petals vary in different collections from 4–7 mm. long, and from having the inner face glabrous or slightly hairy to rather densely hairy.

As I have remarked under *E. nitidus*, the specimens which King referred to it should be referred to *E. robustus* because he misinterpreted *E. nitidus*. One might make a variety of *E. robustus* to accommodate these specimens with oblong leaves, but more collections are necessary before one can be certain that such a difference is constant.

I have found both flowers and fruits of *E. macrocarpa* on the same trees near Baling in Kedah and am thus certain of the floral characters of Ridley's species.

Merrill has proposed the binomial *E. tectorius* (Lour.) Poir. for *E. robustus* (Trans. Ann. Phil. Soc. XXIV, pt. 2, *1935*, p. 256). *E. tectorius* has *Craspedum tectorium* Lour. as its basinym. Merrill admits that Loureiro's description of the fruit of Craspedum must be excepted, and bases his identification on Loureiro's description of the flowers. But I do not think that the description of the flowers as "Flos luteo-viridis, spicis sub-terminalibus, congestis" applies to *E. robustus* which has white flowers

on racemes which are, mostly, borne on the twigs behind the leaves, and the leafy portion of the twigs is long. I do not know why the description of the fruit should be omitted. If Loureiro invented it, then what might he not have invented? It seems that the sole distinction between *Craspedum* and *Elaeocarpus* which Loureiro made was the fruit, the former having a many-seeded berry, the latter a drupe. I consider the identity of *C. tectorium* is still doubtful.

E. rugosus Roxb.

Fl. Ind. II, *1832*, p. 596.

I have followed Kurz in his interpretation of *E. rugosus*, but I am doubtful if it is correct because Roxburgh described his species with subsessile leaves, and those of the Burmese specimens have distinct petioles. However, it seems impossible to disentangle the species of Monocera until many more collections have come to hand and the material from Indo-Malaya generally can be examined critically. The species seem to be rather rare and either variable in several points or several more species must be distinguished after the old ones have been defined anew. It may well be that *E. apiculatus* is really *E. rugosus*, as King suggested, in which case *E. rugosus* sensu Kurz will need another name and *E. rugosus* var. *singaporensis* will have to be transferred. The specimens which I refer, provisionally, to *E. rugosus* are Curtis 3274 and 3570 (Penang Hill).

Var. *singaporensis* Ridley (Fl. Mal. Pen. I, p. 318) differs from *E. rugosus* in its smaller, more obovate leaves, more slender petioles and twigs, smaller flowers (petals 10–14 mm. long with only 7–10 teeth: 16–22 mm. with 10–14 teeth in *E. rugosus*) and, apparently, smaller, rounder fruit. The variety has been mistaken for *E. littoralis*, the petiole of which is not geniculate. The following two collections from Sumatra, identified as *E. littoralis*, should be referred to *E. rugosus* var. *singaporensis*:— Krukoff 4209, 4306.

The variety seems commoner in Malaya than the typical state.

E. sphæricus (Gærtn) K. Schum., Pflanzenf. III-6, *1895*, p. 5. (*E. ganitrus* Roxb.).

Syn.—*E. subglobosus* Merrill, Philipp. Journ. Sci. 4c, *1904*, p. 290.

Both Ridley and Burkill (Dict. Ec. Prod. Mal. Pen., 1935) have excluded this as a native of Malaya. Nevertheless I am certain King was right in recording it as such. I have found it in the high forest in three places in the East

of Johore, about 30 miles inland in Kemaman, in the forest on Penang Hill and in belukar round Kuala Lumpur. In each case I have been aware of the importance of such 'finds' and I carefully studied the trees to be certain that they were forest-grown. Indeed, cultivated specimens of *E. sphaericus* are distinctly rare in Malaya because it is not a plant known to Malays, who have no use for it: yet the forest-trees seem to be not uncommon. The red, lanceolate leaves on the ground and the knobbly round nuts enable one to distinguish the species with certainty from all other forest-trees. It has been collected also by the Forest Department in Pahang.

After studying the specimens of *E. subglobosus* at Singapore and the original description of the species, I conclude that it can be at most only a form of *E. sphaericus* with rather petioles (1.2 cm.) and small flowers (petals 6–7 mm. long). In the Malayan specimens the flowers vary considerably in size, some collections having the petals 12 mm. long, others with petals 10 mm. long, others with petals 8–9, mm. long and yet others with petals 6–7 mm. long. There is no structural difference between *E. subglobosus* and *E. sphaericus*.

Malayan Collections:—

PENANG—Curtis 775, Corner s.n. July 1936.
PERAK—Scortechini s.n.
TRENGGANU—Corner s.n. 23.11.35.
PAHANG—C.F. 15437, 15711.
SELANGOR—C.F. 3325, 16868, 17094, 37554.
JOHORE—Corner s.n. (1935, 1936, 1937).
(SINGAPORE—cult. in Hort. Bot. Lawn Z).

E. stipularis Bl.

Koorders and Valeton have shown that the Malayan specimens referred to this species differ from the Javanese in having fewer stamens (15–25: 30–40 in the Javanese), 5-celled ovary and round fruit (3-celled ovary and oblong-globose fruit in the Javanese) (Bijdr. Booms. Java I, p. 251). I find however that the Malayan specimens may have occasionally, a 3-locular ovary and as many as 35 stamens. Indeed, I think that *E. stipularis* must be regarded as a large species variable in detail such as the size of the flowers, numbers of stamens, number of loculi in the ovary, and shape of fruit. I agree with Ridley (Fl. Mal. Pen. I, p. 312) in calling the Malayan specimens *E. stipularis* and regarding *E. Scortechinii* King and *E. gambir* Becc. as synonyms, though Merrill proposed to call them *E. gambir* (Str. Br. Journ. R. As. Soc. 77, p. 203). The species needs to be monographed from its whole distribution.

E. tahanensis Henderson

Gard. Bull. S. S. V, *1930*, p. 74.

I think that this will prove to be only a mountain variety of the variable *E. floribundus* with lanceolate leaves. I can see no difference between these two species except in the narrower and more pustulate leaves and flowers of *E. tahanensis.*

E. Wrayi King

This species was collected originally from the mountains in the neighbourhood of Taiping in Perak. Ridley referred to it Robinson's specimen from Gunong Tahan in Pahang which he had called *E. monticola,* designating it 'the form *monticola'.* Several more collections are to hand now from G. Tahan and all seem to differ in the almost entire leaf and in slight points of ultimate venation so that I am not convinced that they are the same species as the Perak specimens. More collections are needed to decide this.

Corrected Identifications of Malayan Collections

Identified as *E. acmosepalus:*—
C.F. 4151 (Watson) is *E. longifolius* Bl. var. *fusiformis.*
Identified as *E. Griffithii:*—
Hullett 294, C.F. 12613, SFN 2009, 8341, 10028, 10433, Derry 52, Ridley 274, 359, 418, 1091, are *E. Mastersii.*
Identified as *E. Hullettii* (= *E. palembanicus*) :—
C.F. 3186, is *E. longifolius* var. *fusiformis:* SFN 16081 is *E. salicifolius:*
Cantley 91, C.F. 23821, SFN 11306 are *E. Mastersii.*
Identified as *E. leptomischus:*—
C.F. 14969, 14978, 15477, 15667, 17107 are *E. Griffithii.*
Identified as *E. Mastersii:*—
Goodenough 1768, Derry 197 and 431 are *E. Griffithii:*
C.F. 12723 is *E. glabrescens:*
Identified as *E. nitidus:*—
Wray 2313, Curtis 282 and 463, SFN 1216 are *E. robustus:*
C.F. 4934 is *E. petiolatus.*
Identified as *E. obtusus* (= *E. littoralis*) :—
SFN 10003, Goodenough 1467, C.F. 1835.
C.F. 16925 are *E. rugosus* var. *singaporensis.*
Identified as *E. paniculatus:*—
SFN 8567, 11391, C.F. 22499, 22560 are
E. pseudopaniculatus: Wray 1935, SFN 24118, 24981, 25957,

C.F. 162, 2727, 2778, 3297, Hume 7555, Ridley 7353, Curtis 3578 are *E. Griffithii:* SFN 12599, C.F. 2783, 5425 are *E. petiolatus.*

Identified as *E. parvifolius* (= *E. nitidus*) :—
Ridley 1120, SFN 11602 are *E. stipularis.*

Identified as *E. punctatus:*—
Wray 1223, SFN. 7977 are *E. pseudopaniculatus:*
C.F. 3102 is *E. polystachyus:*
C.F. 15601 is *E. longifolius* var. *fusiformis.*

Identified as *E. robustus:*—
C.F. 22520 is *E. stipularis.*

Identified as *E. petiolatus:*—
Curtis 2534, Ridley 5277, C.F. 20733, SFN 5180 are *E. Mastersii.*

Identified as *E. stipularis:*—
C.F. 189, 694, 890, 4101 are *E. robustus.*

INDEX TO GENERA

	Page		Page
Adenanthera	268	Inocarpus	269
Agathis	246	Lagerstrœmia	272
Artocarpus	280	Lindera	277
Baccaurea	288	Melanorrhœa	260
Bridelia	291	Melastoma	299
Campnosperma	253	Melia	263
Cerbera	273	Millettia	270
Chickrassia	267	Mischocarpus	263
Cinnamomum	276	Nerium	275
Claoxylon	292	Pentaspadon	261
Croton	294	Phœbe	278
Dacrydium	239	Podocarpus	251
Drypetes	295	Pterospermum	262
Durio	302	Quercus	279
Elæocarpus	308	Rhodamnia	272
Endospermum	296	Saraca	272
Erythrina	268	Slœtia	287
Ficus	283	Tabernæmontana	276
Gelonium	299	Taxotrophis	288
Gnetum	247	Tristania	273
Grewia	262	Vitex	256
Heynea	267		

THE TYPIFICATION OF RHUS JAVANICA L.

By C. X. FURTADO,
Botanic Gardens, Singapore.

		Page
1.	TWO INTERPRETATIONS OF THE SPECIES ..	330
2.	THE SYNTYPES OF *Rhus javanica*	331
3.	THE TYPIFICATION BY DR. MERRILL	331
4.	CRITICISMS OF DR. MERRILL'S VIEWS ..	332
5.	RE-INTERPRETATION OF THE SPECIES	333
6.	GENERAL CONCLUSIONS	334

1. Two Interpretations of the Species

Rhus javanica L. has been interpreted in two ways: THUNBERG (Fl. Jap. 1784, p. 121), DE CANDOLLE (Prodr., 1825 p. 67), SPRENGEL (Syst. Veg. I, 1825, p. 937) and most botanists up to very recent times interpreted the species as if it were synonymous with *Rhus semialata* MURR. (1784), the only dissentients of this view being SALISBURY (1796), BENNETT (1844) and Dr. E. D. MERRILL (1928). The stand of the latter may be summarised as follows.

According to BENNETT (HORSFIELD, Plant. Jav. Rar., 1844, p. 200), SALISBURY (Prodr., 1796, p. 171) quoted *R. javanica* L. as a synonym of *Ailanthus gracilis* SALISB.; whether by this SALISBURY meant that the entire species *R. javanica* L. or only *R. javanica* L. *partim* was synonymous with his *Ailanthus gracilis* I am not able to verify. But BENNETT, in criticising DE CANDOLLE for excluding the synonym *R. javanica* L. from the new combination *Brucea gracilis* (SALISB.) DC (1825) (= *A. gracilis* SALISB.), wrote the following:

"DE CANDOLLE omits SALISBURY'S synonym of *Rhus javanica* L. for this plant; which is, however, quite correct so far as regards the specimen in the Linnean Herbarium so marked by LINNAEUS himself; but there is also a specimen of a true *Rhus* (*R. javanica* of authors) pinned on to the specimen of *B* (*rucea*) *sumatrana* thus misnamed."

Dr. MERRILL (Journ. Arnold Arb. IX, 1928, pp. 1–4, pl. 10 & 11), after investigating this problem with reference to the Linnean types, considered that the most widely current interpretation of *R. javanica* (dating from THUNBERG, 1784) should be rejected and the interpretation given by SALISBURY (1796) and BENNETT (1844) should be accepted. Accordingly he published the new combination

Brucea javanica (L.) MERR. for *B. sumatrana* ROXB., and adopted *Rhus semialata* MURR. (1784) as the correct name for *R. javanica* L. *sensu* THUNBERG and others. He rejected the use of *R. chinensis* OSB. (1757) as a *nomen nudum*, but did not give an opinion whether *R. chinensis* MAXIM. (1759) or *R. chinensis* MILL. (1768) is the same plant, though both these names appear to have been validly published and have been considered to be synonymous with *R. semialata* MURR. (1784), than which they are older.

I have re-investigated the problem at the request of Mr. E. J. H. CORNER, who was interested in the nomenclature of *Rhus semialata* MURR. (= *R. javanica* L. *sensu* THUNB. et al.) ; and my conclusions are that the traditional usage should be maintained.

2. The Syntypes of Rhus javanica

On the sheet of *Rhus javanica* L. in the Linnean herbarium there are two specimens, both apparently OSBECK'S, the photographs and other details of which are published by Dr. MERRILL. One is properly mounted on the sheet, and this specimen bears the specific epithet "javanica" in LINNAEUS'S hand; the other is pinned to the sheet and bears a number which indicates that it was referred by LINNAEUS himself to *R. javanica* of the *Species Plantarum* (1753). Apparently both these specimens were in the possession of LINNAEUS when preparing the description of *Rhus javanica* for the *Species Plantarum* (1753) and the brief description would cover both of them. Hence both must be taken as the syntypes of *R. javanica* L. (1753) ; or alternatively both must be rejected from the consideration of the syntypes: there is no proof that one was seen by LINNAEUS while preparing the *Species Plantarum* (1753) and the other not, or seen only after the preparation of the work.

When LINNAEUS described the species, he stated that it was native of Java, but in the second edition of the *Species Plantarum* (1762), he changed its nativity to China. The mounted specimen belongs to the genus *Brucea*, it being identical with *Brucea sumatrana* ROXB., and the other (pinned) belongs to the genus *Rhus*, being identical with *R. semialata* MURR.

3. The Typification by Dr. Merrill

Dr. MERRILL, in discussing the whole question of *Rhus javanica* L. writes:

"Now *Brucea sumatrana* ROXB. (*Rhus javanica* LINN., according to the extant specimen so named by LINNAEUS himself) is locally common at low altitudes in Java, while *Rhus javanica* as currently interpreted occurs in Java only

as an introduced plant and is apparently not common; on the other hand both are very common in thickets throughout the entire region about Canton, south-eastern China. It is thus possible that OSBECK collected the *Brucea* in Java, but this is improbable in view of the fact that the extant specimen represents the Chinese, not the Javan form of *Brucea sumatrana* ROXB. It is most improbable that he observed or collected a true *Rhus* in Java. It is hence probable that the use of the specific name *javanica* was a pure error. It should be remembered that OSBECK did not reach Sweden on his return voyage until June 26th, 1752, while the Species Plantarum was published in 1753. It is clear that the rather numerous references to OSBECK'S plants must have been interpolated in the manuscript by LINNAEUS, and probably this was hurriedly done.

"As noted above, among the few plants cited by OSBECK as having collected in Java, no *Rhus* is mentioned; on the other hand in his Dagbok, p. 232, (1757) he cites among plants collected on September 27, 1751, on Dane's Island (near Whampoa, South-eastern China) *'Rhus chinensis* ... and *Rhus javanica* ....

"Doubtless both plants are those now in the Linnean herbarium, the *Brucea,* marked by LINNAEUS as *Rhus javanica,* and the true *Rhus* which is pinned to same sheet and unnamed except by inference. What apparently happened is that LINNAEUS actually based his short and imperfect description of *Rhus javanica* on the *Brucea,* and later pinned the sheet of *Rhus chinensis* OSBECK to the *Brucea,* altering the locality from 'Java' to 'China', but without changing the specific name in the second edition of his *Species Plantarum,* and without adding OSBECK'S specific name *chinensis* to the specimen; OSBECK, as quoted above, had used the binomial *Rhus chinensis* as a *nomen nudum,* in 1757. This being the case, a strict interpretation of types would involve dropping the specific name *javanica* in *Rhus,* adopting this name for the common and widely distributed *Brucea sumatrana* ROXB. and the further adoption of some other specific name for the *Rhus.*"

"After giving due consideration to all the evidence I am reluctantly forced to the conclusion that the actual type of *Rhus javanica* LINN. is the *Brucea* in the Linnean Herbarium, as named by LINNAEUS, and that this name has nothing to do with *Rhus javanica* of recent authors."

4. Criticisms of Dr. Merrill's Views

Dr. MERRILL'S case as above stated depends on a number of probabilities and possibilities, none of which can be definitely established. Such an argument appears to me

unsatisfactory for rejecting a long accepted typification of a species.

Moreover, Dr. MERRILL'S arguments lead to the conclusion that OSBECK, the collector of the specimens, was in error when he called a species by a name indicating that he had collected it, or at least seen it, in Java; and they moreover overlook the important fact that OSBECK was corresponding with LINNAEUS from the East, so as to furnish the latter with other sources of information concerning his (OSBECK'S) collection besides the field-tickets and the Dagbok. In the introduction to the *Species Plantarum* (1753) LINNAEUS refers to OSBECK'S "Pl. chinensis *in literis, Msc.*", and the numerous references to OSBECK'S plants in the *Species Plantarum* (1753), sometimes accompanied with long, minute descriptions, testify to this. In the second edition of the *Species Plantarum* (1762–1763) LINNAEUS has omitted the reference to the manuscript letters, but has instead a reference to OSBECK'S "Iter Ind. Orient. Holmiæ, 1757" (the Dagbok); and such alterations as were introduced in the second edition of the work concerning the particulars about OSBECK'S plants were apparently based on the information given in OSBECK'S diary or Dagbok.

As regards the manner of mounting, it appears to me that this has not necessarily any significance. The named specimen was presumably mounted first; but that is not evidence that it was the one first identified, or the one on which the published description was based. The description is equally applicable to both.

5. Re-Interpretation of the Species

Leaving the surmises apart, the evidence so far available is that both the specimens were in possession of LINNAEUS at the time of preparing the *Species Plantarum* (1753) and that both had been referred by LINNAEUS himself to *Rhus javanica*. There is no evidence to show that only one of these was examined while framing the diagnosis and not the other. Hence, as said above, either both the specimens must be taken as the syntypes of the species, or, both disregarded in typifying the species.

The mounted specimen was mostly overlooked or ignored, so that the general interpretation of the species from 1784 up to very recent times agreed with the pinned syntype. The species thus interpreted is recorded as native of Sumatra and as an uncommon (probably introduced) plant in Java, and belongs to the genus *Rhus* to which

LINNAEUS originally referred it. Hence there is nothing against taking the pinned syntype as the lectotype of the species.

However, if, disregarding this widely current interpretation, one selects the glued syntype as the lectotype, the following difficulties arise:

(1) "The extant specimen [glued] represents the Chinese, not the Javan form of *Brucea sumatrana* ROXB." (MERRILL), while the specific epithet originally given by the collector himself indicates that the type came from Java—the only locality mentioned in the original description of *Rhus javanica* L:

(2) the interpretation contradicts the obvious intention of LINNAEUS to apply the name *Rhus javanica* to species of the genus *Rhus:*

(3) and consequently the interpretation also leads to: (*a*) the rejection of the oldest and widely current interpretation of the species; (*b*) name changes of the two species, one in the genus *Brucea* and the other in the genus *Rhus.*

Hence, I think it behoves botanists to maintain the oldest and widely current interpretation and to accept the pinned syntype as the lectotype of *Rhus javanica* L. (1753), of which *R. semialata* MURR. (1784), *B. chinensis* MAXIM. (1759) and *B. chinensis* MILL. (1768) are accepted synonyms.

6. General Conclusions

My principal object in writing this note is to draw the attention of taxonomists to the need of some uniform rules which will help one to typify a species containing more than one syntype belonging to more than one species or variety. In my previous paper on the nomenclature of types (Gard. Bull. Straits Settl. IX 1937 pp. 285–309) I demonstrated the need of recognizing the different categories of types in typifying a species, and why the earliest typification on a reasonable basis should be accepted. In another paper published simultaneously in the same Bulletin (pp. 244–249) I drafted some general rules which could be followed in interpreting *Mixta composita.* But it must be emphasized that in equality of circumstances a species should be typified in preference on a syntype which will defend the traditional usage and avoid unnecessary nomenclatural changes.

There are many cases where the specimen first to receive a new manuscript name is not the one cited or selected as the holotype of the published species. Sometimes the first named specimen is imperfect and the

characteristic differences of a species are drawn from a later, more perfect specimen. Hence the fact that a certain syntype was named before another is not of much importance in selecting from the various syntypes a lectotype of the species.

Dr. L. O. WILLIAMS (Bot. Mus. Leaf. Harvard Univ. V, 1938 pp. 171–172) has also made a plea to accept as the lectotype the syntype that, though differing in certain characters from the original description, would accord with traditional usage and prevent unnecessary nomenclatural changes. It is a plea worthy of consideration by botanists.

NOTES ON MALAYAN DIPTEROCARPACEAE V*

by C. F. SYMINGTON,
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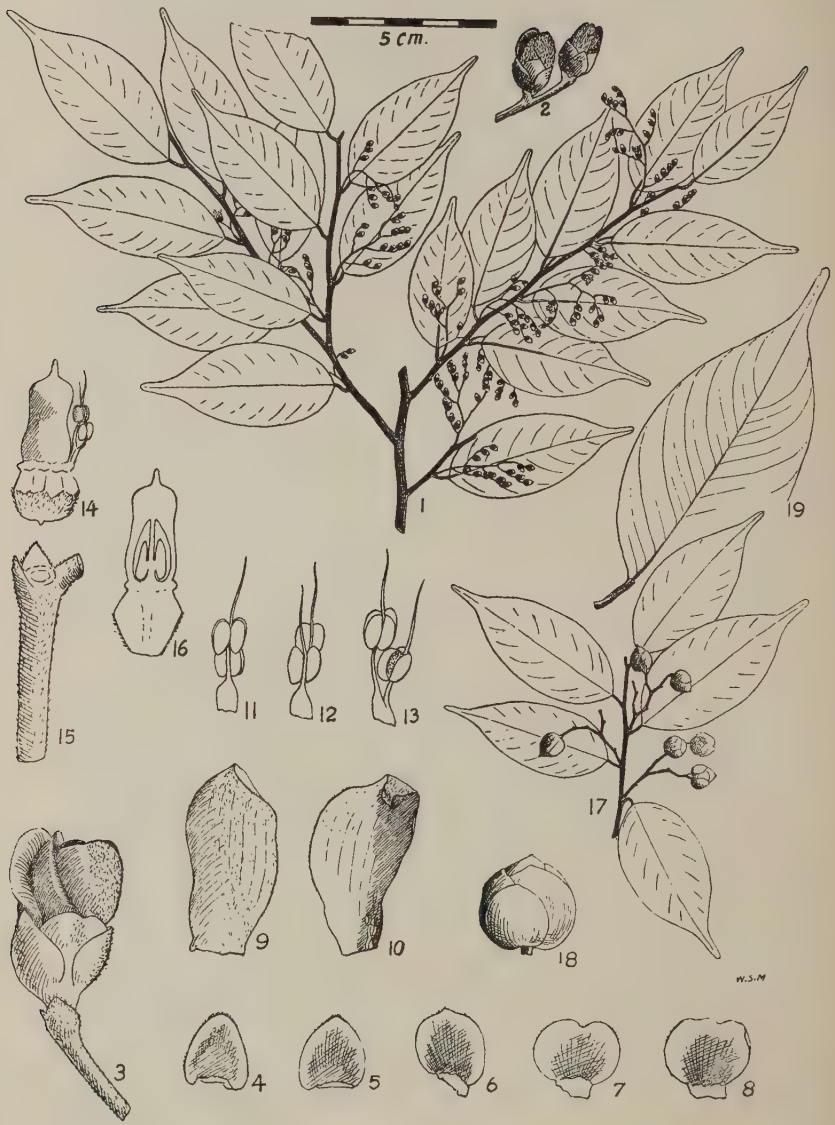
The bulk of this paper is composed of the results of my investigations of species of *Hopea* belonging to the *Bracteata* and *Dryobalanoides* groups. These results are somewhat cataclysmic, involving the addition of ten names to the list of Malay Peninsula species, but as I have been fortunate in being able to study all the critical material concerned, it is hoped that reasonable stability in the nomenclature of *Hopea* will result.

In preparing the botanical notes for Desch's *Commercial Timbers of the Malay Peninsula: I, the genus Shorea* [*Mal. For. Rec.* 12 (1936)] I endeavoured to straighten out the nomenclature of our species as far as possible at the time, but, for one reason or another, some species received tentative names only. In the last paper in this series a few of these species were given more permanent binomials, while in this paper most of the remainder are considered. The recent acquisition of flowering herbarium material of *Shorea atrinervosa, S. lumutensis,* and *S. Meadiana,* has made it possible to describe these three species, all of which are in the *Eushorea* group, while additional field and herbarium study has revealed the desirability of changing the names or status of several other species.

One of the name-changes involved is that of *Shorea eximia* (Miq.) Scheff. to *S. ovalis* (Korth.) Bl. I mention this in particular, because it illustrates very nicely the sort of problem the systematist has frequently to tackle in this region. *S. ovalis* is based upon a sterile specimen of seedling leaves which differ very markedly from those of the mature tree. Thus, before the species could be interpreted it was essential, firstly, *to see the type specimen,* and secondly, *to have representative collections of immature stages of this form for comparison.* The first of these precepts is generally appreciated, although not always followed by the systematist, owing to impatience or necessity: but to the second, I think, inadequate attention is given. The much despised, sterile, immature specimen is frequently the key to interpretation of early, obscure species, which play such havoc with accepted nomenclature if they

* For previous papers see *Gard. Bull. S.S.* Vol. VII, pp. 129–159 (1933), Vol. VIII, pp. 1–40 (1934) and 265–292 (1935), and Vol. IX, pp. 319–354 (1938).



Hopea minima Sym. var. *penangiana* Sym.

are left too long in obscurity, and it is therefore very desirable that the intelligent collection of such material should be encouraged.

The description of only three new Bornean species is given in this paper, namely *Shorea leptoclados, S. Flemmichii,* and *Dryobalanops Keithii.* Although little is offered for publication, the study of Bornean dipterocarps has made good progress during the year. For this we are particularly indebted to Messrs. H. G. Keith and C. O. Flemmich, the forest officers in North Borneo and Brunei, respectively. In addition to continuing to pursue their extremely energetic policy of collection of herbarium material, these gentlemen organized most interesting and comprehensive tours for me, on which I had the invaluable opportunity of studying the dipterocarps in the field.

Dr. van Slooten's visit to Kepong, during April, 1938, did much to stimulate systematic research on the dipterocarps, and his generosity in placing at my disposal the valuable early Dutch collections is greatly appreciated. I am also indebted to the Forest Botanist of the Forest Research Institute, Dehra Dun, for sending on loan his entire collections of *Shorea, Hopea,* and *Balanocarpus;* to the Director of the Forest Research Institute, Buitenzorg; and to numerous other botanists and forest officers whose assistance, if less spectacular, is no less valued.

These notes are arranged as in my previous papers, the concluding paragraph under each heading being a brief *précis* for the benefit of Malayan forest officers.

In previous papers, under citation of specimens, I have followed Foxworthy in prefixing numbers in the Federated Malay States Forest Department series with the letters "C.F." I propose, in future, to substitute for this prefix "Forest Dept. F.M.S." The original specimens in this series are, in all cases, preserved in the herbarium of Forest Research Institute at Kepong, for which I intend to employ the contraction "Kep." proposed by Lanjouw in *Chronica Botanica* 3: 347 (1937).

Hopea minima Symington, **nom. nov.** *Balanocarpus Curtisii* King in Journ. Asiat. Soc. Bengal 62: 131 (1893) et in Ann. Bot. Gard. Calcutta 5, pt. 2: 158, plate 191 a. (1896); Brandis in Journ. Linn. Soc. 31: 111 (1895) quoad speciminum penangiorum; Burkill in Journ. Str. Br. R. As. Soc. 81: 59, fig. 26–45 (1920); Ridley, Fl. Mal. Penins. 1: 246, fig. 23F. (1922). *Balanocarpus bracteatus* sensu Merr., Bib. Enum. Born. Pl. 407 (1921), et sensu Foxw., Mal. For. Rec. 10: 142 (1932) quoad synon. B. Curtisii; non Hopea bracteata Burck. **Plate 11.**

The earliest collections of this species were made by Kunstler (1882 and 1884) and Wray (1888) in Perak, and Curtis (1888 and 1893) on Penang Island. It was first described by King in 1893 who, in 1896, published a figure accompanied by an almost identical description. He named the species *Balanocarpus Curtisii.*

In 1895 Brandis united *B. Curtisii* with *Hopea bracteata* Burck (1887) from Borneo but, following the "Kew Rule", he retained King's name. The combination *Balanocarpus bracteatus* was made by Merrill in 1921 to conform with the "International Rules".

I do not agree with Brandis in this union. The flowers are, as he says, structurally almost identical, but they are more distinctly pedicellate and the panicle is very much more lax that any collection of *Hopea minima sensu lato.* Moreover, there is an undefinable difference in *facies*—they *look* different!

I have already* expounded my views on the generic affinities of this plant. It belongs to an as yet undefined group of *Hopea,* very closely allied to the section *Dryobalanoides* Miq., which is characterized by persistent, paired bracteoles on the inflorescence. To this group, which for convenience I shall call the *Bracteata* group, belong *Hopea bracteata* Burck, *H. Griffithii* Kurz, *H. nigra* Burck, *H. subalata* Sym., *H. nervosa* King, *H. sublanceolata* Sym., and some others.

While removing King's *Balanocarpus Curtisii* to the genus *Hopea,* a new name must be sought, because a *Hopea Curtisii* (synonym of *H. sangal* Korth.) already exists. *Hopea minima* seems appropriate for this small tree which, on Penang Island at any rate, never exceeds about 40 feet in height and may mature at a height of only 10 feet.

King has given quite adequate descriptions of this species, but he did not draw attention to the fact that there are two distinct forms. The collections from Penang differ from those from Perak and elsewhere on the mainland. The differences are slight, but so constant that specific separation might be considered justifiable. I think, however, that the best way to treat them is to constitute two varieties as follows—

Folia elliptico—lanceolata, basi subcuneata; ramuli petiolique fere glabri; paniculi densiflori .... **var. penangiana var. nov.**

Folia ovato-lanceolata, basi obtusa; ramuli petiolique puberuli; paniculi laxiores ..... var. **perakensis var. nov.**

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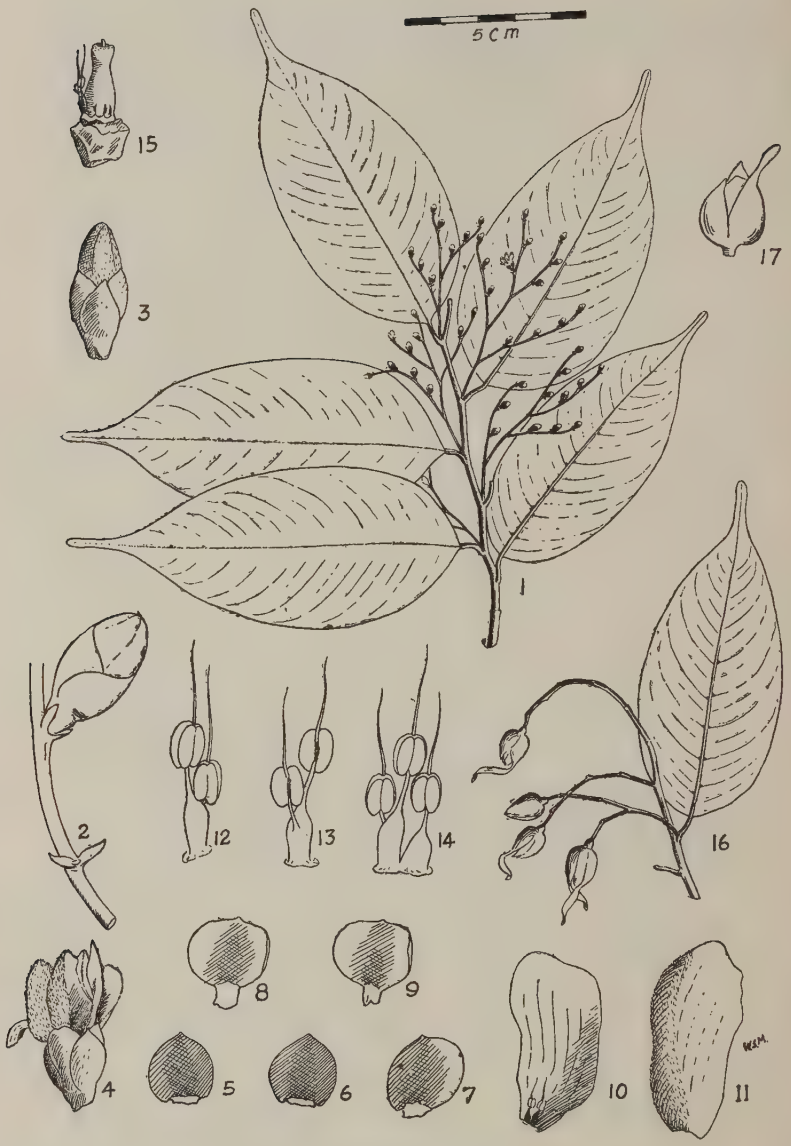
* *Gard. Bull. S.S.* 8: 26–29 (1934).



Hopea subalata Sym.

When describing *B. Curtisii*, King had before him flowering and fruiting material of both forms but, although he has taken the specific name from the collector of the Penang specimens and placed them first in his list of citations, his description and figure are apparently drawn mainly from the Perak collections of Kunstler and Wray. Also the figure published in the *Ann. Bot. Gard. Calc.* shows clearly the puberulous branchlet and lax panicle of the Perak form.

Collections examined:—

MALAY PENINSULA:

PENANG (var. *penangiana*): Curtis 1406 (flower, 1888) (Syntype of *Balanocarpus Curtisii* King and Type of *Hopea minima* var. *penangiana* Sym.); Curtis 1406 (fruit, 1893) and *s.n.* (flower, 1901).

Also—Ridl. *s.n.*; S'pore Field No. 3141, 3322, 3364, 3402, 3493, 3722, 3749; Forest Dept. F.M.S. 11657, 28022.

PERAK (var. *perakensis*): Wray 2860, Kunstler 3171, 3294 and 6543 (Syntypes of *Balanocarpus Curtisii* King. Wray 2860 may be taken as the Type of *Hopea minima* var. *perakensis* Sym.).

Also—Forest Dept. F.M.S. 175.

PAHANG: The following incomplete specimens exist: it is doubtful to which variety they belong—S'pore Field No. 16520; Forest Dept. F.M.S. 5088, 37320.

The species here renamed *Hopea minima* Sym. is a small, smooth-barked, stilt-rooted form of *merawan* which is best known from the vicinity of the Waterfall Gardens in Penang. Originally it was named *Balanocarpus Curtisii* by Dr. King. While transferring the species to *Hopea* a new name must be given, because a *Hopea Curtisii* already exists.

The species also occurs in Perak but the Perak specimens are considered to differ varietally from the Penang ones. Two varieties are therefore here described, var. *penangiana* Sym. from Penang, and var. *perakensis* Sym. from Perak.

Hopea subalata Symington, **sp. nov.** *Balanocarpus ovalifolius* sensu Foxw., Mal. For. Rec. 10: 143 (1932) partim; non B. ovalifolius Ridl. **Plate 12.**

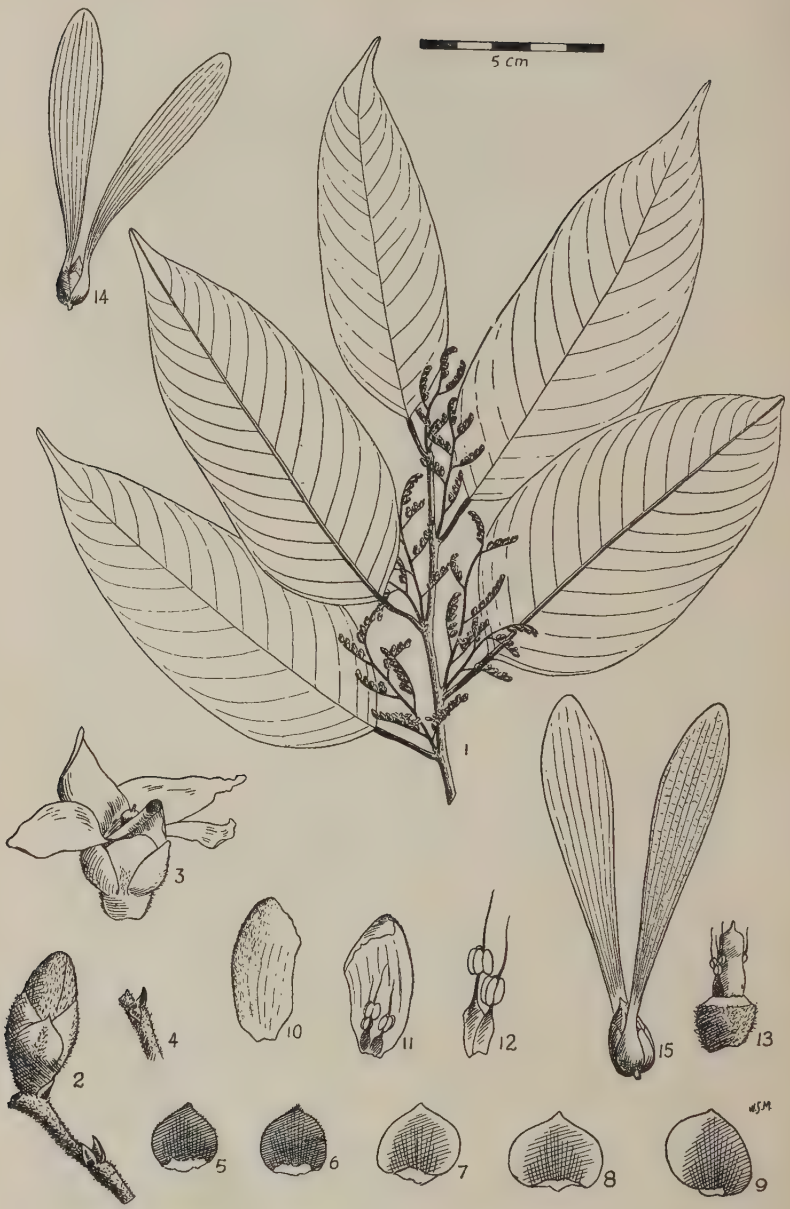
H. minimæ Sym. valde affinis sed omnibus partibus majoribus, paniculis laxioribus satis distincta.

Branchlets rather fine, dark, puberulous towards the ends with short, prominent, decurrent leaf traces. *Leaves* oval to ovate, acuminate, about 9.0 cm. long (including the narrow, blunt acumen 1.5 cm. long) × 4.5 cm. broad, glabrous except for the midrib on the upper surface, drying pale grey-green above and darker beneath (both surfaces may have a silvery sheen due to the presence of minute silvery scales); midrib slightly depressed above but

tomentose, prominent and glabrous beneath; main nerves about 10 to 13 pairs with occasional shorter intermediate nerves, inconspicuous above, fine but distinct beneath and sometimes with small tufted domatia in the axils of the lower ones; reticulations invisible to the naked eye; petioles about 5.0 mm. long, slightly channelled or subterete, tomentose or glabrescent. *Panicles* axillary towards the ends of the branchlets, in solitary (occasionally paired) racemes up to 6.0 cm. long; racemes glabrescent, dark-coloured when dry; branchlets about 2.0 cm. long, delicate, 2 to 5-flowered, subtended by caducous bracteoles. *Flowers* about 5.0 mm. apart and about 3.0 mm. long, each subtended by small, triangular, glabrous or ciliate, subpersistent, paired bracteoles; pedicel very short, glabrous. *Sepals* glabrous except for a few setæ on the exposed portions; two outer ovate-rotundate, blunt or acute at the apex; three inner broader than long, sinuate at the apex. *Petals* oblong, blunt, tomentose on the portions exposed in bud, purple (D.B. Arnot, Forest Dept. F.M.S. 13045). *Stamens* 15, arranged as in most species of *Hopea;* filaments broad at the base, narrowing abruptly to the filamentous upper portions; anthers 4-celled, cells subequal; appendage to connective filiform, slightly longer than the filament and anther. *Ovary* and stylopodium oblong, truncate, constricted in the upper portion, glabrous; apex of the stylopodium pellucid gland-dotted, forming a ring around a depressed portion in which is set the style; style short, oblong-conical; stigma minute. *Fruit* a wingless or shortly 1-or 2-winged nut, all parts glabrous; stalk short but prominent, about 1.0 mm. long; nut ovate-conical, shortly apiculate, about 1.3 cm. long, enclosed except towards the apex by the closely appressed bases of the calyx-lobes; calyx-lobes woody at the base, cemented together and to the nut by a sparse, resinous cement; one or both of the two outer lobes sometimes developed into short, rudimentary wings which occasionally exceed 1.0 cm. in length.

This species, which is known only from one locality in Selangor, was first collected in 1921. The specimens were in fruit: flowers were obtained in 1927. These fruiting specimens, and one other sterile specimen, were the basis of what Foxworthy called *Balanocarpus ovalifolius* Ridl. Ridley's species, however, as I have pointed out elsewhere [*Gard. Bull. S.S.* 8: 28 (1934)], has no real existence, being based on a mixture of *Hopea Beccariana* Burck and *Shorea Maxwelliana* King.

The only flowering collection (Forest Dept. F.M.S. 13045), which becomes the type of *H. subalata* Sym., was referred by Foxworthy to *Hopea intermedia* King.



Hopea sublanceolata Sym.

H. subalata is clearly a member of what I have called (*vide* p. 338) the *Bracteata* group. Its closest ally is probably *H. minima* Sym., but it differs in being larger in all parts and in having rudimentary wings. In this latter respect it is of particular interest because it exhibits a transition between the winged and wingless members of the group.

Collections examined:—

MALAY PENINSULA:

SELANGOR: Forest Dept. F.M.S. 13045 (Type of *H. subalata* Sym.); D.B. Arnot; Kanching Forest Reserve, Compt. 1; 9th August, 1927; flower. Field notes—"Tree, inflorescence purple".

Also—Forest Dept. F.M.S. 5796, 14901, 22074, 24921, 29770, 29831, 32376.

The species here described as *Hopea subalata* Sym. is a small, smooth-barked tree with pronounced stilt roots. It occurs in Compt. 1 of Kanching Forest Reserve in Selangor. No vernacular name is known but *merawan* or *merawan jangkang* would probably be given to it. In *Mal. For. Rec.* 10 this tree is confused with *Balanocarpus ovalifolius* Ridl.

Hopea sublanceolata Symington, **sp. nov.** *H. nervosa* sensu Foxw., Mal. For. Rec. 10: 129 (1932) partim; non H. nervosa King. **Plate 13.**

H. nervosae King valde affinis sed paniculis petiolisque gracilioribus, foliis tenuioribus, nervis intermediis haud conspicuis differt.

Branchlets glabrous, pale towards the ends. *Leaves* lanceolate to ovate-lanceolate, caudate-acuminate at the apex, acute to shortly cuneate at the base, averaging about 12.0 × 4.3 cm., glabrous and usually drying pale greenish-yellow on both surfaces; midrib slightly depressed above, prominent beneath; main nerves about 15 pairs, very faint on the upper surface, fine but prominent on the lower, intermediate nerves absent or very faint; nervules joining the main nerves in fine wavy lines, hardly visible on either surface; petioles subterete, rather slender, about 1.5 cm. long, glabrous, drying black. *Panicles* axillary towards the ends of the branchlets, or terminal; racemes solitary or two (rarely three) together, up to 5.0 cm. long; sparsely cinereous pubescent towards the ends; ultimate branchlets up to 1.7 cm. long, 2 to 6-flowered, pubescent. *Flowers* secund, 1.0–1.5 mm. apart, about 3.0 mm. long in mature bud; pedicel very short, pubescent. *Sepals* puberulous on the outside; two outer broadly ovate; three inner slightly larger and broader, acute. *Petals* oblong, fimbriate at the apex, minutely tomentose on the portions exposed in bud, "corolla falling in one piece; petals deep, dark red with light tips" (Symington, 30808). *Stamens* 15, in three rows

arranged as in most species of *Hopea;* filaments broad at the base, narrowing abruptly about the middle to the filamentous upper portion; anthers 4-celled, cells subequal; appendage to connective filiform, about as long as the filament and anther. *Ovary* and stylopodium broadly cylindrical, truncate, slightly constricted just above the middle, glabrous; style short, cylindrical; stigma minute. *Fruit* glabrous; stalk short; sepal bases very thick and woody; two large sepals spathulate, up to 10.0 × 2.0 cm. and 9-nerved but frequently much smaller; three small sepals closely appressed to the nut, without, or with only rudimentary, free portions; nut ovate-conical, up to 2.0 cm. long, shortly blunt apiculate, frequently shining with a resinous coating, closely embraced in the lower half by the imbricate sepal bases.

Several collections of this species have been made in the Malay Peninsula since 1920. In 1932 Foxworthy referred five of these collections (S'pore Field No. 6929; Forest Dept. F.M.S. 10377, 12192, 8818, 12070) to *Hopea nervosa,* with which species they are certainly closely related. Both species belong to the *Bracteata* group (*vide* p. 338) and both have unusually large leaves and fruits. The chief distinguishing characters are these:—

H. sublanceolata—buttresses not, or inconspicuously, stilted; twigs light-coloured when dry; petioles about 1.5 cm. long, slender, drying black; leaves lanceolate or ovate-lanceolate, acute or shortly cuneate at the base; intermediate nerves absent or very faint; panicles with 2 to 6 flowers per branchlet.

H. nervosa—buttresses usually markedly stilted; twigs dark or pale lepidote; petioles coarser, about 1.0 cm. long, frequently pale lepidote; leaves usually oblong or elliptic-oblong, usually rounded at the base; intermediate nerves frequently present and conspicuous; panicle branchlets with not more than 4 flowers.

Collections examined:—

MALAY PENINSULA:

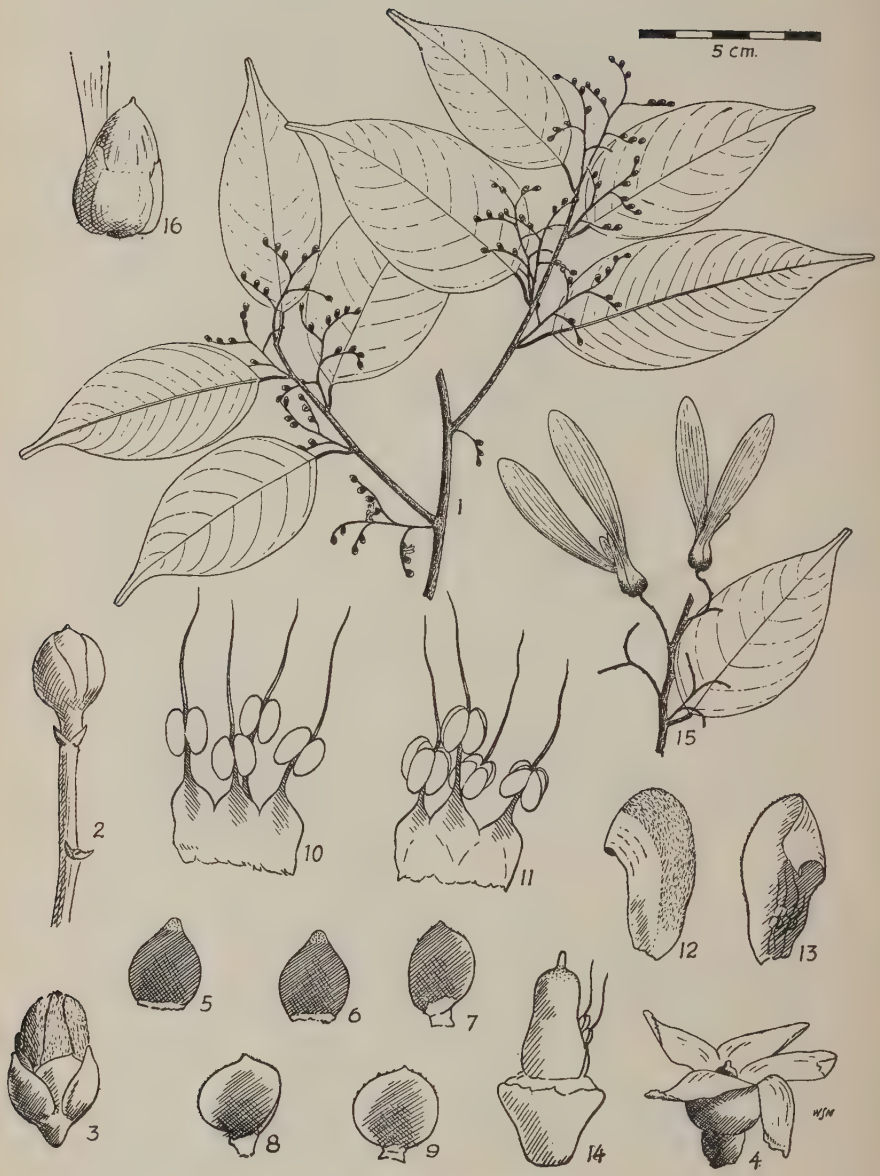
KEDAH: Forest Dept. F.M.S. 42292.

PERAK: Forest Dept. F.M.S. 30808 (Type of *H. sublanceolata* Sym.); C.F. Symington; Sumpitan, Upper Perak, low-lying land; 6th April, 1933; flower. Field notes—"Tree 3 ft girth; coarse *jangkang* habit not very obvious; bark flaking in small scales; small exudations of clear damar from bole; inner bark slightly pink; corolla falling in one piece; petals deep dark red with light tips".

Also—Forest Dept. F.M.S. 8818, 10377, 12070, 12192, 30342, 30804, 39151; S'pore Field No. 6929.

KELANTAN: Forest Dept. F.M.S. 29119, 32845, 33260.

PAHANG: Forest Dept. F.M.S. 40420.



Hopea Griffithii Kurz.

Hopea sublanceolata is a large-leaved *Hopea* which occurs mainly in the north of the Peninsula and in Temerloh District of Pahang. It has rather an unusual bole which has been described as resembling *petaling* (Ochanostachys amentacea), and in Perak North it has been called *jerawai*. The leaves resemble those of *Hopea nervosa* (merawan jangkang) with which species it was formerly confused.

Hopea Griffithii Kurz in Journ. Asiat. Soc. Bengal 42, pt. 2: 60 (1873) et For. Fl. Brit. Burma 1: 122; Dyer in Hook. f. Fl. Brit. Ind. 1: 310 (1875); Brandis in Journ. Linn. Soc. (Bot.) 31: 69 (1895) var. pedicellata excl., et Indian Trees: 68 (1911); Sym. in Gard. Bull. S.S. 9: 324 and 329 (1938) in obs. *Hancea Griffithii* (Kurz) Pierre, Fl. For. Cochinch. 4 (1891) in nota sub t. 248. *Hopea Pierrei* sensu Ridl., Fl. Mal. Penins. 1: 238 (1922) partim; non H. Pierrei Hance. **Plate 14.**

Branchlets rather fine, glabrous, usually drying dark purple or black. *Leaves* ovate to ovate-lanceolate, caudate-acuminate at the apex, subacute to rounded at the base, averaging about 7.0 × 3.5 cm. on Malayan specimens but considerably variable, glabrous, drying grey-brown on the upper surface and dull purple-brown on the lower; midrib slightly depressed above, elevate beneath; main nerves 10 to 14 pairs with 1 to 3 shorter intermediate nerves between each, usually invisible above, faint and hardly elevate on the lower surface; reticulations invisible to the naked eye; petioles slender, about 0.5–1.0 cm. long, glabrous, drying black. *Panicles* axillary towards the ends of the branchlets, or terminal; racemes solitary or paired, usually less than 3.0 cm. long, glabrous, drying black; branchlets about 0.4 cm. apart, up to 1.5 cm. long, 2 to 5-flowered, subtended by caducous bracteoles. *Flowers* about 3.0 mm. apart, about 3.0 mm. long in mature bud, each subtended by minute, triangular, glabrous, black, persistent, paired bracteoles; pedicel very short, glabrous. *Sepals* drying black; two outer ovate, obtuse, glandular at the apex; three inner subrotundate, shortly acuminate, ciliate along the upper margins. *Petals* oblong, tomentose on the portions exposed in bud, red (Ridley). *Stamens* 15, in three rows arranged as in most species of *Hopea;* filaments broad in the lower half, narrowing abruptly to the filamentous upper portion; anthers 4-celled, cells subequal; appendage to connective filiform, as long as the filament and anther. *Ovary* and stylopodium broadly cylindrical, slightly constricted just above the middle, glabrous, gland-dotted at the apex; style short, cylindrical; stigma minute. *Fruit* glabrous; stalk very short, attached at a concavity formed by the woody bases of the sepals; two large, accrescent sepals spathulate,

blunt, up to 5.0 × 1.2 cm., woody at the base, chartaceous on the free portions, about 9-nerved; three small sepals oblong, blunt, hardly enlarged beyond the nut, or up to 1.0 cm. long; nut ovate-conical, shining, surmounted by a short blunt apicula, embraced in the lower half by the closely appressed, imbricate sepal bases.

Hopea Griffithii was briefly described by Kurz in 1873 from a flowering collection made by Griffith in Mergui, Tenasserim. In 1875 Dyer improved slightly on Kurz's description by describing the floral bracteoles.

Brandis, in 1895, was the first materially to alter the circumscription of the species. He included four additional collections (Ridley, Singapore; Curtis 167, Penang; Forbes 3205 and 3208, Sumatra), and amended the specific description to admit them. Ridley's Singapore collection is presumably No. 4738 of which sheets are preserved at Kew, Leiden, Singapore, and Buitenzorg. This collection has broader leaves than the Burmese type of *H. Griffithii* but the texture of all parts, and the floral structure, are identical. Ridley referred it to *H. Pierrei*, but the shape of ovary denies this possibility and I consider that Brandis was correct in referring it to *H. Griffithii*.

The collections of Curtis and Forbes, which Brandis cited, were made the basis of his variety *pedicellata*. These collections have a similar stylopodium to *H. Griffithii* but, as I have stated in *l.c.*, they differ markedly in other respects and should be kept specifically distinct. I have made Curtis 167 the basis of *H. pedicellata* (Brandis) Sym.

Hopea Griffithii is clearly a member of the *Bracteata* group (*vide* p. 338).

Collections examined:—

BURMA:

TENASSERIM: Griffith 717 (Iso-holotype of *H. Griffithii* Kurz in Herb. Kew).

MALAY PENINSULA:

KELANTAN: Forest Dept. F.M.S. 29128, 32742, 33437, 37846, 37850, 37972.

TRENGGANU: Forest Dept. F.M.S. 26705, 26906.

PAHANG: Forest Dept. F.M.S. 15635, 17402, 31674, 43132.

JOHORE: Forest Dept. F.M.S. 45944, 45949.

SINGAPORE: Ridley 4738 (? Herb. Lugd. Bat. 902146, 377 and 378), Ridley 5093, Mohd. Nur. *s.n.* (Gardens' Jungle, 5th Oct. 1920).

Hopea Griffithii is a form of *merawan* originally described from Burma. It was collected in the Botanic Gardens' Jungle, Singapore in 1893, but botanists have disagreed concerning the identity of the Singapore tree. It is here concluded that the Singapore collection is conspecific with the type of *H. Griffithii*. The species occurs throughout the east of the Malay Peninsula, from Kelantan to Singapore.

Hopea dryobalanoides Miq.

Hopea dryobalanoides Miq., Fl. Ind. Bat. Suppl.: 492 (1860); Scheff. in Nat. Tijdschr. N.I. 31: 351 (1870); Burck in Ann. Jard, Bot. Buitenz. 6: 240 (1887); King in Journ. Asiat. Soc. Beng. 62, pt. 2: 125 et 126 (1893) in notæ; Brandis in Journ. Linn. Soc. (Bot.) 31: 69 (1895); Boerlage, Cat. Hort. Bogor. 104 (1901); Heyne, Nutt. Plant. Ned. Ind. 1107 (1927) in nota; Endert in Tectona 28: 248-311 passim (1935); Rappard in Tectona 30: 897–913 passim (1937). *?Hopea sarawakensis* Heim (**syn. nov.**) in Bull. Soc. Linn. Paris 2: 971 (1891); Brandis in l.c. 69 (1895). *Hopea micrantha* sensu King in l.c. 126, in nota; sensu Foxw., Mal. For. Rec. 10: 135 (1932) partim; non H. micrantha Hook. f. **Plate 15.**

Branchlets dull reddish-or grey-brown, more or less lenticellate. *Leaves* usually elliptic to oblong-lanceolate, rather variable, bluntly caudate-acuminate at the apex, slightly unequal at the base, usually rounded on one side and acute on the other, average size about 7.5 × 2.75 cm., glabrous on both surfaces; usually drying dull grey-or yellow-brown above, slightly darker but shining on the lower surface; midrib slightly raised on the upper surface, rather sharply keeled beneath; main nerves about 12 pairs with 1 to 3 hardly less prominent intermediary nerves between each, slightly depressed but inconspicuous on the upper surface, hardly elevated but clearly defined and usually light yellow on the lower surface, occasionally with hairy domatia in their axils; reticulations hardly visible to the naked eye; petioles about 8.0 mm. long, slightly thickened in the upper portion, glabrous; stipules minute, caducous. *Panicles* terminal and axillary towards the ends of the branchlets; racemes usually solitary but occasionally paired, short, rarely exceeding 3.0 cm. in length or with more than 6 alternating branchlets; branchlets about 13.0 mm. long or less, 2 to 6-flowered, the flowers about 2.0 mm. apart. *Flowers* subovate in bud, pedicellate, about 4.0 mm. long (including the pedicel); pedicel about 1.0 mm. long, apparently glabrous at low magnifications. *Sepals:* two outer ovate, thick, puberulous outside, tomentose at the apex on both surfaces; three inner subrotundate, thinner, puberulous outside and fringed with minute hairs. *Petals* linear-oblong, slightly fimbriate at the apex, tomentose on the portions exposed in bud, creamy white to pale yellow in the throat of the corolla (Symington). *Stamens* 15, arranged in the manner usual in this group; filaments broad and flattened at the base, narrowing in the upper half (abruptly in mature stamens), 2 to 3 times as long as the anthers; anther cells subequal; appendage to connective filiform, about as long as the filament, sometimes sparsely glandular-tuberculate.

Ovary ovate-conical, glabrous, narrowing gradually to the style; style cylindrical-filiform, about as long as the ovary, glabrous or furnished with a ring of minute hairs at the base*; stigma minute. *Fruit* shortly but conspicuously stalked, glabrous; calyx-lobes thickened and woody at the base, closely embracing the lower portion of the nut and cemented to it by a resinous exudation; two long wings spathulate, up to 6.0 × 1.3 cm. but frequently shorter and narrower, about 7-nerved; three lobes obtuse at the apex and only ½ the height of the nut; nut ovate-conical, pointed (the style sometimes persists as an awn-like apiculus until maturity), up to 13.0 × 9.0 mm. when mature, free on the upper half.

Hopea dryobalanoides was described by Miquel, in 1860, from two collections made by Teysmann in East Sumatra. The Priaman specimen consists of fragmentary immature fruit, twigs, and leaves: the Sungei Pagu specimen has leafy twigs only. In 1887 Burck stated that the two collections represented different species, the Sungei Pagu one being *H. mengarawan* Miq.** He states that the fruits described by Miquel under *H. dryobalanoides* are *H. mengarawan:* but the fruits accompany the Priaman specimen, not the Sungei Pagu one!

King accepted Burck's opinion concerning the mixed nature of Miquel's species. In 1893 he suggested that *H. micrantha* Hook. f. (or what he thought was *H. micrantha* Hook. f.!) was *H. dryobalanoides* Miq. *emend.* Burck, but concluded that, because of the supposed mixed nature of Miquel's species and the lack of flowers, it should be suppressed as a species.

King's suggestion apparently did not find support from Dutch botanists. In 1901 Bœrlage appears to have, rightly in my opinion, considered both Teysmann's original collections of *H. dryobalanoides* as conspecific, and with them identified tree number VII. B. 23, cultivated in the Botanical Gardens, Buitenzorg.

Although there are no important references to *H. dryobalanoides* in subsequent systematic works, and the species has never been adequately described, it is mentioned frequently in forestry literature of the Netherlands Indies as one of the main producers of high quality damar (*damar mata kuching*).

* The presence or absence of this hairy ring is fairly constant in any given specimen, although the hairs are less evident in mature flowers than in young buds, but varies between collections: *e.g.* Forest Dept. F.M.S. 623 and 2121 have a distinct ring, Forest Dept. F.M.S. 17326 has traces of a ring only in young bud, while Forest Dept. F.M.S. 30912 and H.B. 938.12.5*b* have no hairs.

** King considered the same collection to be *Hopea micrantha* Hook.f.

Hopea myrtifolia Miq.

In 1891, Heim described a Bornean collection of Beccari as *H. sarawakensis*. The specimen has only immature fruits but, in my opinion, does not differ in any essential from *H. dryobalanoides* Miq. Actually when describing the species Heim stated that "*Cette espêce ne peut en l'absence de l'anatomice, être qu'imperfaitment differencée de l'* Hopea borneensis".

H. dryobalanoides has been collected from time to time in the Malay Peninsula, but no specific name was put to the specimens until Foxworthy, in 1932, referred them, along with some of *H. sulcata* Sym., to *H. micrantha*.

Collections examined:—

MALAY PENINSULA:

KELANTAN: Forest Dept. F.M.S. 32832.

PERAK: Forest Dept. F.M.S. 30912.

SELANGOR: Forest Dept. F.M.S. 729, 13280, 24007, 24085, 29745.

NEGRI SEMBILAN: Forest Dept. F.M.S. 625, 2110, 2121, 2123, 2147, 23794, 46106.

PAHANG: Forest Dept. F.M.S. 10606, 17304, 17305, 17326, 17345, 45017.

SINGAPORE: ? S'pore Field No. 2879 (fruits only).

SUMATRA: Teysmann *s.n.* (H.B. 587; 938.12.2: Utrecht 035932) Sungei Pagu (Syntype of *H. dryobalanoides* Miq.) and Teysmann *s.n.* (H.B. 938.12.4). Teysmann *s.n.* (H.B. 2073; 938.12.3: Utrecht 035933) Priaman (Syntype of *H. dryobalanoides* Miq.). Herb. De Vriese No. 26 (Herb. Lugd. Bat. 902144, 382).

Also—Heyne's native collector *s.n.* and bb. 21535 (Bengkulen).

JAVA: H.B. 938.12.5 (Cult. VII. B.23); H.B. 6515 (Cult. ex Bangka).

BORNEO:

SARAWAK: Beccari 2897 (Iso-holotype of *H. sarawakensis* Heim in Herb. Kew). S'pore Field No. 36108 (= Forest Dept. Sarawak A0658).

WEST BORNEO: *bb.* 17519 and *bb.* 21687.

The specific identity of the forms of *Hopea* producing *damar mata kuching* in the Malay Peninsula has long been in doubt. It is here shown that one of these species is *H. dryobalanoides* Miq. which has for many years been recognized as a source of high grade damar in the Netherlands Indies.

Hopea myrtifolia Miq., Fl. Ind. Bat. Suppl. 493 (1860); Scheff. in Nat. Tijdschr. N.I. 31: 351 (1870); Burck in Ann. Jard. Bot. Buitenz. 6: 242 (1887); Brandis in Journ. Linn. Soc. (Bot.) 31: 71 (1895) quoad spec. Teysm.;? Heyne, Nutt. Plant. Ned. Ind. 1107 (1922) in nota; non sensu Endert in Tectona 28: 248–311 passim (1935). **Plate 16.**

Branchlets grey-brown, covered with a close, soft, fulvous-grey tomentum towards the ends. *Leaves* ovate-oblong, with a short blunt acumen at the apex, rounded at

the base or sometimes slightly unequal with one side subacute, from 4.5 × 2.4 cm. or less to 10.0 × 5.0 cm., glabrous except for the midrib, usually drying dull grey-green on the upper surface and yellow-brown on the lower; midrib slightly raised and tomentose above, prominent but glabrous beneath; main nerves about 12 pairs, separated from one another by intermediary nerves some of which are almost as long and prominent as the main nerves, hardly visible above, faint but visible on the lower surface, sometimes with a few tufted domatia in their axils; reticulations hardly visible to the naked eye; petioles 4.0–10.0 mm. long on mature leaves, densely tomentose; stipules not seen. *Panicles* terminal and in the axils of the upper leaves; racemes solitary or paired, 5.0 cm. long at most, usually with 5 to 7 alternating branchlets; branchlets about 4.0 mm. apart, the longest about 1.5 mm. long with 6 secund flowers about 2.0 mm. apart. *Flowers* about 5.0 mm. long including the pedicel; pedicel 2.0 mm. long, glabrous. *Sepals* furnished with minute waxy scales outside; two outer broadly ovate, thick, with waxy masses in the apical portions on the inner side; three inner sepals subrotundate, pointed or subfimbriate at the apex, glabrous inside. *Petals* oblong-linear, fimbriate towards the apex, tomentose on the portions exposed in bud. *Stamens* 15, arranged in the manner usual in this group; filaments broad and flattened at the base, narrow in the upper portion; anther cells subequal; appendage to connective about as long as the filament, sometimes sparsely furnished with a few small glandular tubercles. *Ovary* in shape intermediate between the *H. Pierrei* and *H. pedicellata* types, minutely gland-dotted; style short, cylindrical, erect; stigma minute. *Fruit* entirely glabrous: stalk short but prominent, about 1.5 mm. long; calyx-lobes woody at the base, closely appressed to the lower half of the nut; two outer lobes wing-like, very narrow near the base, broad above, about 4.5 × 0.9 cm., about 8-nerved, thin and papery; three inner lobes broad, irregular at the apex, about half as high as the nut; nut ovate-conical, about 9.0 × 7.0 mm., crowned by a short but prominent sharp apiculus, more or less resinous.

Hopea myrtifolia was described by Miquel in 1860 from a collection made by Teysmann at Kebang, Lampong, Sumatra. The material, which consists of sterile immature branchlets, is represented by one sheet in the Utrecht Herbarium (Utrecht 035927) and two in the Buitenzorg herbarium (one of which is marked H.B. 4321). The Utrecht sheet bears a larger branchlet with some leaves more mature than those on the Buitenzorg sheet.

In view of the unsatisfactory nature of the type material it is not surprising that the species has remained

in comparative obscurity. The only additional collection cited in botanical literature is Beccari 3021, which Brandis considered to be *H. myrtifolia.* In this he was obviously wrong; Becc. 3021 represents an undescribed species related to *H. bracteata* Burck.

H. myrtifolia is mentioned in the forestry literature of the Netherlands Indies as one of the main sources of high grade damar. This may be the case, and if my interpretation of the species is correct, *H. myrtifolia* does produce a high grade damar, but there is no evidence that, when speaking of *H. myrtifolia,* Dutch forest officers have had this species in mind. Indeed the only herbarium material from the N.I., that I have seen identified as *H. myrtifolia,* has been what I consider to be *H. ferruginea* Parijs.

We have only a few collections of *H. myrtifolia* from the Peninsula. One was made in 1919 but the rest are quite recent. To identify these with Teysmann's sterile immature specimens may seem rather rash, but there is such a marked similarity in shape of leaves, and texture and tomentum of all parts, that I feel reasonably confident about it. Some of our collections of slightly immature leaves are an excellent match for the more mature portions of Teysmann's type collection.

Hopea myrtifolia is undoubtedly very closely related to *H. pedicellata* (Brandis) Sym., which differs only in the more abruptly truncated stylopodium, the longer and narrower leaves, and the less tomentose branchlets. Detached mature leaves may be almost indistinguishable.

Collections examined:—

MALAY PENINSULA:

PERAK: Forest Dept. F.M.S. 4553, 28623, 31042, 31087, 33915, 41909, 41911, 41915, 43367, 44992, 47301, 47305, 47307, 47309.

PAHANG: Forest Dept. F.M.S. 41016.

NEGRI SEMBILAN: Forest Dept. F.M.S. 46071.

SUMATRA:

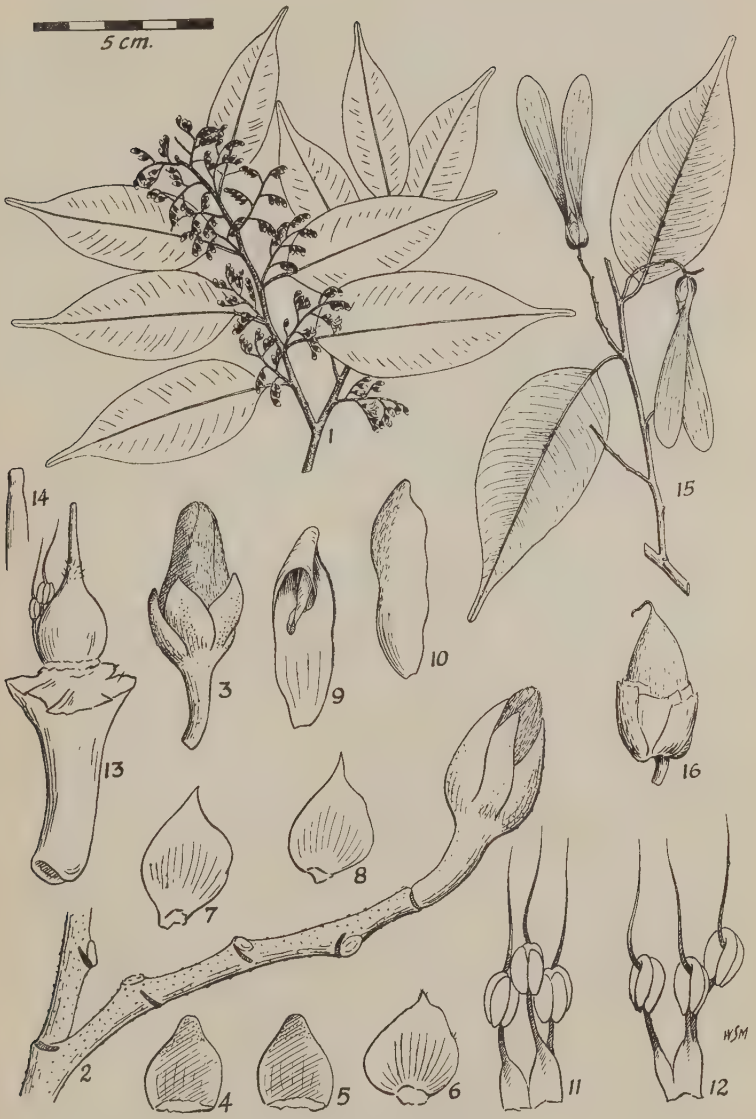
LAMPONG: Teysmann *s.n.* Kebang (H.B. 4321 and 938. 12.15, and Utrecht 035927: Holotypes of *H. myrtifolia* Miq.).

Hopea myrtifolia Miq. is a form of *merawan* producing *damar mata kuching.* It was originally described from sterile, immature material collected in Sumatra and its identity has been obscure: it is here identified with an hitherto unidentified tree which has been collected in Chikus and Bikam forest reserves in Perak, at Kuala Sungei Tahan in Pahang, and in Pasoh Forest Reserve in Negri Sembilan.

Hopea ferruginea Parijs in Fedde Repert. 33: 243 (1933). *H. micrantha* sensu Dyer in Hook. f. Fl. Brit. Ind. 1: 310 (1874) partim, quoad spec. Maing.; sensu King in Journ. Asiat. Soc. Bengal 62, pt. 2: 124 (1893) partim,

quoad Maing. 210; sensu Brandis in Journ. Linn. Soc. (Bot.) 31: 70 (1895) partim; sensu Ridl., Fl. Mal. Penins. 1: 237 (1922) partim; sensu Foxw., Mal. For. Rec. 2: 167 (1922) in nota, et Mal. For. Rec. 10: 136 (1932) partim; sensu Buckley, Mal. For. Rec. 11: 21 (1932) in nota; non H. micrantha Hook. f. *H. myrtifolia* sensu Heyne, Nutt. Plant. Ned. Ind. 1107 (1922) in nota (?); sensu Endert in Tectona 28: 248–311 passim (1935); non H. myrtifolia Miq. *H. intermedia* sensu Foxw., Mal. For. Rec. 3: 74 (1927) et Mal. For. Rec. 10: 134 (1932) partim; non H. intermedia King. *H. Pierrei* sensu Foxw., Mal. For Rec. 10: 133 (1932) quoad Holmb. 820; non H. Pierrei Hance. **Plate 17.**

Branchlets slender, with rather prominent decurrent leaf traces, silvery to ferruginous scurfy-tomentose towards the ends, later becoming glabrous, dark, and lenticellate. *Leaves* elliptic-lanceolate to subovate, caudate-acuminate at the apex, slightly unequal, acute to rounded and sometimes reflexed at the base, about 6.0 × 2.5 cm. but rather variable, glabrous (except for the midrib) on both surfaces but more or less covered with a minute silvery scurf, usually drying dull grey-green or silvery on the upper surface and yellow- or reddish-brown on the lower; midrib elevate and more or less tomentose on the upper surface, slightly keeled and glabrous on the lower; main nerves 12 to 16 pairs, separated by slightly shorter and hardly less prominent intermediate nerves, almost invisible on the upper surface, faint and hardly elevate on the lower, occasionally with tufted domatia in the axils of nerves near the centre of the leaf; petioles about .6 cm. long, fulvous or ferruginous-tomentose; stipules minute, caducous, *Panicles* axillary or terminal, tomentose or sparsely minutely hairy, of solitary racemes up to 3.0 cm. long; ultimate branchlets up 9.0 mm. long (usually about 5.0 mm.), 2 to 7-flowered. *Flowers* about 1.0 mm. apart, secund, about 3.0 mm. long and ovate-oblong in mature bud; bracteoles caducous; pedicel slender, about 1.0 mm. long, glabrescent. *Sepals:* two outer subovate, blunt and thickened at the apex, sparsely squamulose to densely squamulose-tomentose at the apex outside, squamulose at the apex inside; three inner subequal in height or slightly taller than the outer ones, broader and thinner, acute or acuminate and sparsely setulose at the apex. *Petals* linear-oblong, slightly fimbriate at the apex, sericeous on the portions exposed in bud, pale yellow. *Stamens* 15, arranged in the usual manner for this group; filaments broad at the base, narrowing about the middle to the filamentous upper portion; anthers 4-celled, the anterior cells slightly smaller than the posterior; appendage to connective filiform, as long as the filament and anther. *Ovary* ovate, narrowing



Hopea ferruginea Parijs

at the apex to the style, glabrous but for a ring of setose hairs at the base of the style*, style erect, cylindrical, about as long as the ovary, glabrous but for the setæ at the base; stigma minute. *Fruit* glabrous; stalk prominent, about 1.0 mm. long; two outer calyx-lobes developed into wings, about 4.0 × 0.8 cm., narrow towards the woody base, chartaceous, about 7-nerved; three inner lobes not enlarged beyond the apex of the nut; nut ovate-oblong, about .8 cm. long, surmounted by the thin, usually bent (frequently broken) remnant of the style, sometimes coated with a resinous cement, embraced except on the upper third by the inner calyx-lobes.

The earliest preserved collections of this species appear to be those made by Maingay in Malacca, in 1867. Two collections were made—no. 1203 on 22nd April, and no. 1394 on 25th May—but both were given the Kew Distribution number 210. In the *Flora of British India* (1874) these collections were enumerated under *Hopea micrantha* Hook. f. which had been previously described from Borneo, and this interpretation has mainly been followed by subsequent authors on the flora of the Malay Peninsula, although there has been much, and varied, confusion of this species with others.

In 1893, King included Maingay's collections in his *H. micrantha*, which is a mixture of *H. ferruginea* Parijs, *H. pedicellata* (Brandis) Sym., and *H. Dyeri* Heim. In 1895, Brandis excluded from *H. micrantha* most of King's Peninsular citations, but continued to include Maingay 210, and added Cantley 12, another collection of *H. ferruginea* made about 1880.

Ridley (1922) cited collections of *H. ferruginea* made by Maingay, Cantley, and Goodenough, under *H. micrantha*, but included specimens of *H. pedicellata* (Brandis) Sym. and *H. Dyeri* Heim along with them. In 1932, Foxworthy cited several additional collections of *H. ferruginea*, some under *H. intermedia* and some under *H. micrantha*, both of which, however, include collections of other species. He also cited Holmberg 820 under *H. Pierrei*.

Although this tree has never been properly understood botanically, it has aroused the interest of forest officers from time to time because it produces a high grade damar. It is mainly to this species that the reference to *damar mata kuching* in *Mal. For. Rec.* 2: 167 (1922), 10: 116 and 136 (1932), and 11: 21 (1932) apply.

* This setose ring of hairs is very variable: in some specimens it is broad, while in others it is reduced to a few hairs, or may be entirely absent. The condition of the ring does not appear to be dependent upon the age of the flower.

I can find no definite references to the species previous to 1933 in the botanical literature of the Netherlands Indies, but numerous collections have been made by the Forest Department of the Netherlands Indies since 1915. Some of these have been identified in manuscript with *H. micrantha* Hook. f., *H. Pierrei* Hance, or *H. myrtifolia* Miq., and economic notes concerning *"damar mata koetjing"* in the literature of the Forest Department under these names are probably mainly referable to this species.

It was in connection with the chemical study of a damar sample that the species received the name *Hopea ferruginea* Parijs (1933). Endert (1935) has indicated that he considers that Parijs' species should be reduced to synonymy with *H. myrtifolia* Miq. With this I do not agree, being of opinion that Parijs has actually described a species hitherto lacking a legitimate name.

Collections examined:—

MALAY PENINSULA:

PERAK: Forest Dept. F.M.S. 24609, 28806.

SELANGOR: Forest Dept. F.M.S. 21979, 47311, 47312, 47313; Ridl. 13206.

PAHANG: Forest Dept. F.M.S. 4644, 37315, 38009.

NEGRI SEMBILAN: Forest Dept. F.M.S. 702, 1902, 2916, 4254, 4260, 6557, 18883, 18893, 23806, 26602, 43532.

MALACCA: Maing. 1203 and 1394 (= K.D. 210; Herb. Lugd. Bat. 902146–375); Alvins 9; Goodenough 1444, 1554; Holmberg 820; Derry 124; Forest Dept. F.M.S. 2011, 2012, 9510, 18275, 25203, 25285.

JOHORE: Cantley 12; Forest Dept. F.M.S. 5208, 5846, 5858, 45943.

RHIO ARCHIPELAGO:

PULAU SUGI: bb. 20386.

SUMATRA:

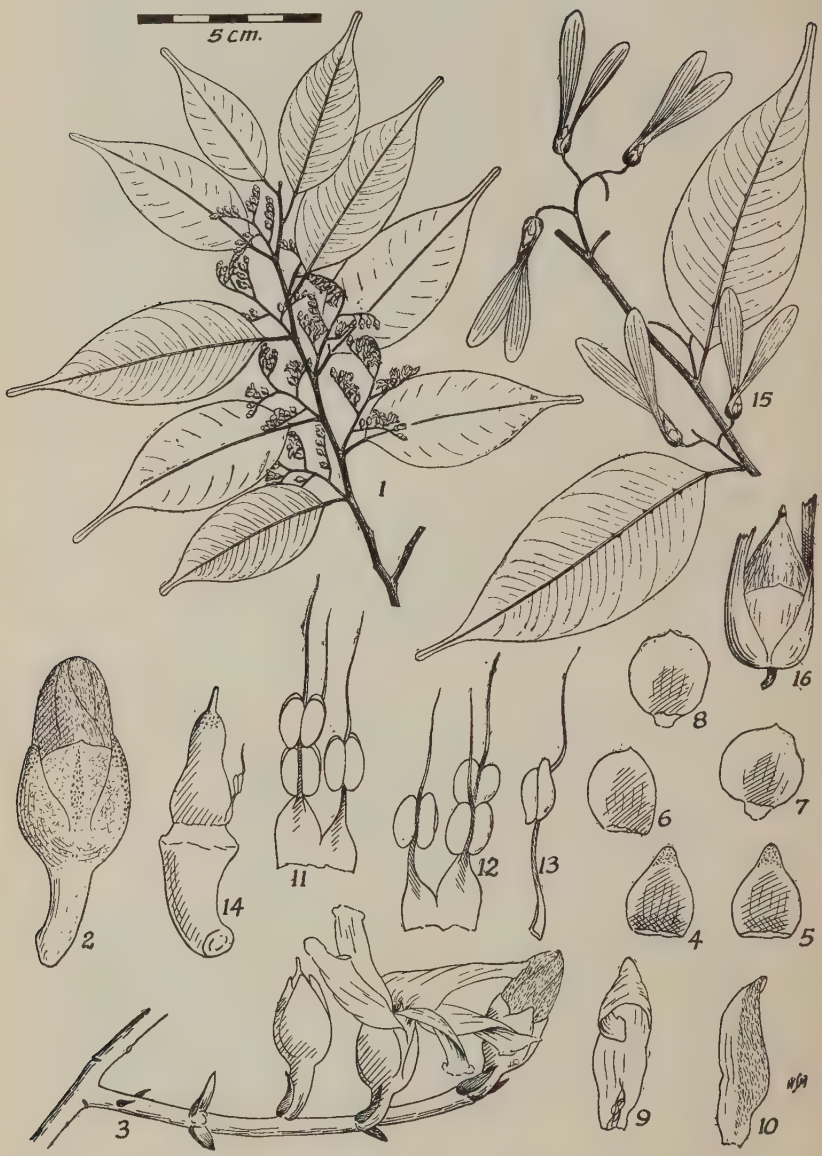
JAMBI: bb. 14459 (Holotype or Iso-holotype of *H. ferruginea* Parijs *ex* Herb. F.R.I. Buitenzorg).

PELEMBANG: bb. 187; H.B. 933.21.62; Field no. 8c, 193 (Herb. Lugd. Bat. 908353–258), Field No. 14c, 199 (Herb. Lugd. Bat. 908353–305).

BORNEO:

SOUTH-WEST RESIDENCY: 1803 I (bb. 473; Utrecht 052390), 1803 II (bb. 474), 1871 (H.B. 938.10.87); bb. 13358, 20236, 20410.

Hopea ferruginea Parijs is here shown to be the correct botanical name for the form of *merawan* which appears to be the chief source of *damar mata kuching* in the Malay Peninsula. The tree is common in the Kuala Pilah district of Negri Sembilan where damar-tapping used to be carried on experimentally and commercially. The identity of the species has never been fixed with certainty, but it has usually been referred to *Hopea micrantha* or *Hopea intermedia* in publications of the F.M.S. Forest Department.



Hopea Dyeri Heim.

Hopea Dyeri Heim in Bull. Soc. Linn. Paris 2: 972 (1891); Brandis in Journ. Linn. Soc. (Bot.) 31: 68 (1895); Merr., Bib. Enum. Born. Pl. 402 (1921) quoad Becc. 2962; Sym. in Gard. Bull. S.S. 8: 53 (1934) et 9: 323 et 324 (1938) in notæ. *Hopea micrantha* sensu Burck in Ann. Jard. Bot. Buitenz. 6: 239 (1887) partim, quoad Becc. 2504*; sensu King in Journ. Asiat. Soc. Beng. 62: 124 (1893) partim, quoad King 3525; non Hopea micrantha Hook. f. *Hopea microptera* Dyer (Ms. in Herb. Kew) ex Brandis in l.c. pro synon. *Hancea microptera* (Dyer) Pierre, Fl. For. Cochinch. 4 (1891) in nota sub t. 248. *Hopea intermedia* King in l.c. 126 (1893) partim, quoad Kunstler 3709, et in Ann. Bot. Gard. Calcutta 5, pt. 2: 156 (1896) partim, quoad Kunstler 3709; Brandis in l.c. 67 partim, quoad Kunstler 3709; sensu Foxw., Mal. For. Rec. 10: 134 (1932) quoad Forest Dept. F.M.S. 5433. *Hopea Pierrei* sensu Brandis in l.c. 67 partim, quoad Becc. 2504 et 3050; sensu Ridl., Fl. Mal. Penins. 1: 238 (1922) partim; sensu Foxw., l.c. 133 quoad Kunstler 3525; non Hopea Pierrei Hance. **Plate 18.**

Branchlets slender, usually drying dark brown to black, lenticellate, glabrescent. Leaves ovate-lanceolate, caudate-acuminate at the apex, subequal and cuneate at the base, about 6.5 × 2.6 cm., glabrous on both surfaces, usually drying dark purple-brown and waxy-glaucescent on the upper surface, yellow-brown on the lower; midrib slightly raised on both surfaces; main nerves about 8 pairs, separated by hardly less prominent intermediate nerves, invisible on the upper surface, not elevate but clearly defined on the lower, usually furnished with small domatia in the axils of the lower pairs; petioles slender, about .7 cm. long, glabrescent; stipules minute, caducous. *Panicles* axillary or terminal, glabrous, of solitary or paired racemes which rarely exceed 2.0 cm. in length; ultimate branchlets about .6 cm. long, 3 to 5-flowered. *Flowers* about 1.0 mm. apart, secund, subtended by minute paired bracteoles which may be semi-persistent, about 3.0 mm. long and ovate-oblong in mature bud; pedicel about 1.0 mm. long, glabrous. *Sepals* glabrous; two outer subovate glandular-papillose towards the apex on both surfaces; three inner about the same height but broader and thinner. *Petals* linear-oblong, slightly fimbriate at the apex, sericeous on the portions exposed in bud, pale yellow. Stamens 15, arranged in the usual manner for this group, filaments broad at the base, narrowing about the middle to the filamentous upper portion;

* Burck also cites Becc. 2964, possibly in error for 2962 which is the type of *H. Dyeri* Heim.

anthers oval, 4–celled, the anterior cells almost as large as the posterior; appendage to connective filiform, about as long as the filament and anther. *Ovary* and stylopodium of the "hour-glass" type; style short; stigma minute. *Fruit* glabrous; stalk about 1.0 mm. long, prominent; two outer calyx-lobes developed into wings about 4.0 × 0.7 cm., narrow towards the woody base, chartaceous, about 5-nerved; three inner lobes usually not enlarged beyond the lower half of the nut; nut ovate-conical, apiculate, shining, about .7 cm. long, embraced in the lower half by the calyx-lobes.

The earliest collections of this species were made by Beccari in Sarawak [numbers 2504 (fl.), 2962 (immature ft.) and 3050 (ft.)].

In 1887 Burck enumerated Becc. 2504* as *Hopea micrantha* Hook. f., but it is improbable that he actually compared the flowers of this collection with those of *H. micrantha* Hook. f., or he could not have failed to note the marked difference in stylopodium.

Dyer examined Becc. 2962 at Kew, giving it the manuscript name *Hopea microptera*. This name was never validly published, although it is mentioned in synonymy by later authors and is the basis of *Hancea microptera* Pierre.

Hance (1891) was the first to publish a name for the species when he based his *Hopea Dyeri* on Becc. 2962. In 1895, Brandis enumerated only this one collection under *H. Dyeri*, failing to identify Becc. 2504 and 3050 with it. Apparently misled by the similar stylopodium he placed these two collections under *Hopea Pierrei*, where there remained until I suggested their removal in 1938.

The earliest collections from the Malay Peninsula were made by Kunstler (3525 and 3709) in Perak in 1882–83. The former of these was referred by King to *Hopea micrantha*, and the latter was cited under *Hopea intermedia* by both King and Brandis. Ridley cited Kunstler's specimens under *H. Pierrei*, and Foxworthy cited no. 3525 under the same name.

Subsequent collections from the Peninsula are not numerous, and with the exception of 5433, cited by Foxworthy under *H. intermedia*, have been neglected in botanical publications.

This species is in leaf rather like *Hopea dryobalanoides* Miq. but it may be distinguished by the typical bottle-shaped ovary and stylopodium seen also in *H. Pierrei* Hance and *H. Beccariana* Burck.

Collections examined:—

MALAY PENINSULA:

PERAK: Kunstler 3525 (Herb. Lugd. Bat. 902146–376), 3709; Forest Department F.M.S. 14383.

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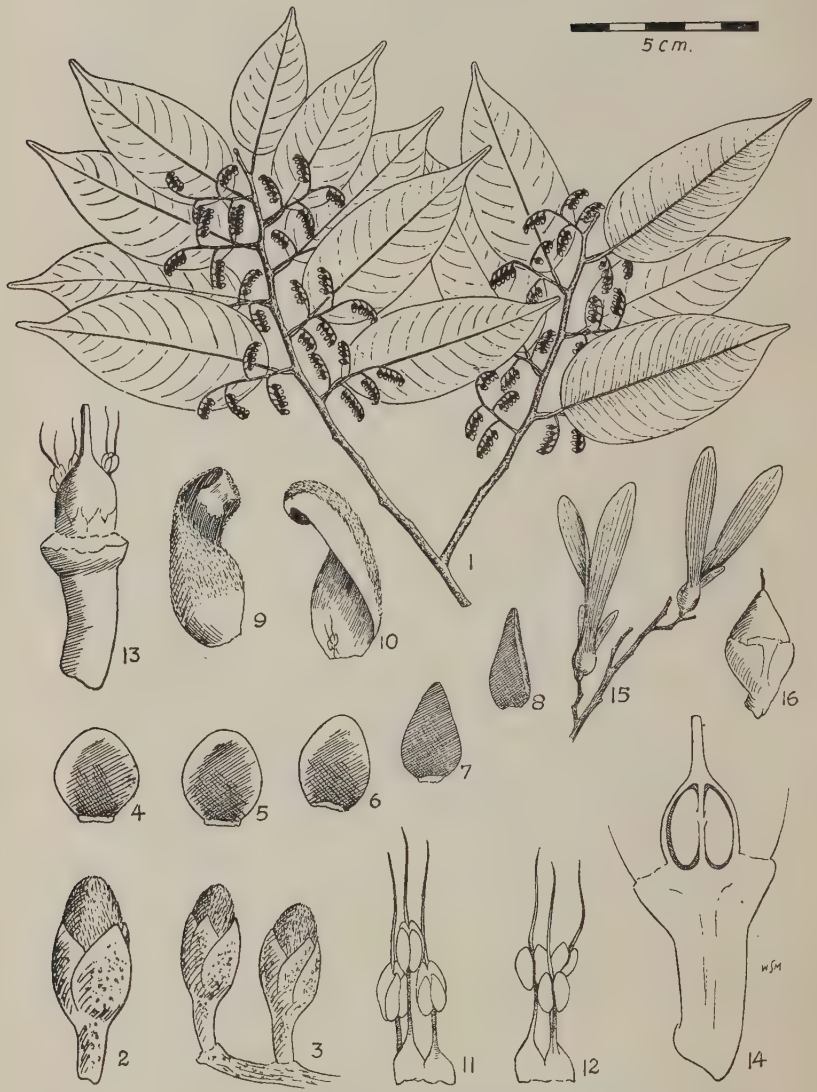
* *See* footnote on p. 353.



Hopea micrantha Hook.f.

TRENGGANU: S'pore Field No. 30142, 30184.
SELANGOR: Forest Dept. F.M.S. 18248, 48026.
NEGRI SEMBILAN: Forest Dept. F.M.S. 1906, 1907, 1923 to 1926, 48018.
PAHANG: Forest Dept. F.M.S. 4509, 5433.
BORNEO:
SARAWAK: Becc. 2504, 2962 (Iso-holotype of *Hopea Dyeri* Heim in Herb. Kew), 3050.

Hopea Dyeri Heim is a smooth-barked, stilt-rooted form of *merawan* of fairly wide distribution, but not very abundant, in the Peninsula. It is very similar in leaf and other characters to the species producing *damar mata kuching*, but does not itself produce globular or stalactitic exudations of damar. Early botanical collections of the species have been confused with others under a variety of names, the species never having been properly understood.

Hopea micrantha Hook. f. in Trans. Linn. Soc. 23: 161 (1862); Dyer in Hook. f., Fl. Brit. Ind. 1: 310 (1874) partim, quoad spec. Born.; Burck in Ann. Jard. Bot. Buitenz. 6: 239 (1887) partim, quoad Motley 215; Brandis in Journ. Linn. Soc. (Bot.) 31: 70 (1895) partim, quoad Motley 215; Merr., Bib. Enum. Born. Pl. 402 (1921) quoad Motley 215; Sym. in Gard. Bull. S.S. 9: 323–329 passim (1938); non H. micrantha sensu Hance in (Lond.) Journ. Bot. 15, 242 (1876); non sensu King in Journ. Asiat. Soc. Bengal 62, pt. 2: 124 (1893); non sensu Burkill in Journ. Str. Br. R. As. Soc. 81: 58 (1920) et Dict. Econ. Prod. Mal. Penins. 1190 (1935); non sensu Ridl., Fl. Mal. Penins. 1: 237 (1922); non sensu Foxw., Mal. For. Rec. 2: 167 (1932) in nota, et 10: 135 (1932). Non *Hopea micrantha* (Hassk.) Benth. et Hook. f. ex Heim, Rech. Dipteroc. 64 (1892) in obs. *Hancea micrantha* (Hook. f.) Pierre, Fl. For. Cochinch. 4 (1891) in nota sub t. 248. **Plate 19.**

Branchlets subterete, dark, minutely pale lepidote towards the ends. *Leaves* minutely lepidote, elliptic-ovate or ovate-lanceolate, caudate-acuminate at the apex, rounded at the base, usually about 7.0 × 3.0 cm., glabrous and drying yellowish-grey on the upper surface, glabrescent and dull yellow-brown on the lower; midrib slightly raised on both surfaces; main nerves about 13 pairs with 1 to 3 slightly less prominent intermediate nerves between each, faintly visible and slightly depressed on the upper surface, faint and hardly raised on the lower; petioles about 7.0 mm. long, subterete, lepidote. *Panicles* axillary towards the ends of the branchlets, or terminal; racemes solitary, less than 3.0 cm. long, sparsely furnished with minute waxy scales and hairs; ultimate branchlets about 1.0 cm. long, each with

4 to 6 secund flowered about 1.5 mm. apart. *Flowers* ovate-oblong in bud, about 4.0 mm. long including the pedicel; pedicel about 1.0 mm. long, drying black, sparsely minutely waxy-lepidote. *Sepals* drying black, sparsely, minutely waxy-lepidote outside; two outer ovate; three inner rotundate. *Petals* linear-oblong, tomentose on the portions exposed in bud. *Stamens* 15, in three rows of 5, arrayed as in most species of *Hopea;* filaments broad at the base, narrowing rather abruptly to a long filiform portion; anthers oval, 4-celled, the posterior cells larger than the anterior; appendage to connective filiform, about as long as the filament and anther. *Ovary* broadly cylindrical, narrowing to the style, glabrous; style erect, cylindrical, glabrous, about as long as the ovary; stigma minute. *Fruit** glabrous; pointed at the base; stalk very short; sepals woody at the base, chartaceous above; two large wings about 4.0 × 0.8 cm., blunt at the apex, very slightly constricted in the lower half, but slightly broader and tending to be auriculate at the base, about 7-nerved; three inner wings up to 1.5 cm. long but usually less; nut conical, about .8 cm. long, tapering gradually into the persistent style, coated with a resinous cement, closely appressed by and cemented to the imbricate bases of the sepals.

Hopea micrantha was originally described in 1862 from specimens (Nos. 215 and 100) collected by Motley in Labuan. Both specimens appear to have been considered in drawing up the description, but it is mainly based on no. 215 which bears flowers. No. 100 is sterile, and differs from 215 in the more ovate and inæquilateral, cuneate leaves. I do not think it is the same species and am therefore restricting Hooker's name to Motley 215. Motley 100 may be *Hopea sulcata* Sym. (*see* p. 359).

In 1874, Dyer recorded an extension of distribution of *H. micrantha* to the Malay Peninsula, citing "Malacca, Maingay". Presumably these are the sheets preserved under the *Hopea micrantha* cover at Kew with the Kew Distribution Number 210. Two separate collections are included under K.D. 210. (1) Field No. 1203, April 22nd 1867, and (2) Field No. 1394, May 25th 1867. In my opinion neither is *Hopea micrantha* Hook. f. Both sheets have flowers with ovaries and styles similar in shape to *H. micrantha* Hook. f., but the leaves and general *facies* is rather distinct. I consider them to be *H. ferruginea* Parijs (*vide* p. 351).

Dyer amplified Hooker's description with a brief description of the fruits. I do not know upon what collection his observations of fruits are based, but from the fact

* The only known fruiting collection (Sarawak 00322) has slightly immature fruits.

that he says "bases of fruiting calyx-segments ¼ in. long with two gibbosities at the bottom", one might suspect a collection of *H. sulcata* Sym.

There have been many subsequent misinterpretations of the species. In 1876, Hance referred a Cambodian collection doubtfully to *H. micrantha,* but in the same year, realizing that it was distinct, he described it as a new species, *Hopea Pierrei.*

In 1897, Burck excluded the Malay Peninsula specimens referred to *H. micrantha* by Dyer, but included Beccari 2504 and 2964 from Borneo. Beccari 2504 is, in my opinion, *H. Dyeri* Heim. Becc. 2964 I have not seen, unless this number has been cited in error for 2962 which is the type of *H. Dyeri* Heim.

King, in 1893, retained the Malacca collections of Maingay under *H. micrantha* and added Kunstler 3525, which I considered to be *H. Dyeri* Heim, and three collections of Curtis (167, 266, 1397) and Kunstler 8170, which I consider to be *H. pedicellata* (Brandis) Sym. It is evident that King had mainly what we now call *H. pedicellata* in mind as *H. micrantha.*

Brandis removed some of King's citations under *H. micrantha,* but retained the Maingay collections from Malacca and added Cantley 12, which is also *H. ferruginea* Parijs.

Ridley's *H. micrantha* is mainly a mixture of *H. ferruginea* Parijs and *H. pedicellata* (Brandis) Sym., while Foxworthy's includes specimens of *H. sulcata* Sym., *H. dryobalanoides* Miq., *H. ferruginea* Parijs, and *H. sangal* Korth.

Numerous collections of *Hopea,* now preserved in the herbaria at Utrecht, Leiden, and Buitenzorg, have been wrongly identified as *H. micrantha* by other Dutch botanists, but I cannot find any attempt by them to elucidate the identity of *H. micrantha* in published works.

The confusion which exists is, of course, due to the very close similarity of many species in the *Dryobalanoides* section of *Hopea.* Of all the specimens cited from time to time under the name of *H. micrantha,* I consider that Motley 215 from Labuan (the original specimen) is the only one correctly placed in that species. I have only seen three other collections, which I feel can be referred to Hooker's species in the strict sense. I would have preferred to have awaited additional collections from the type locality before venturing even to say that these are identical with Motley 215, but as examination of the only remaining patch of jungle on the Island of Labuan failed to reveal any *Hopea,* the prospect of ever obtaining such collections is negligible.

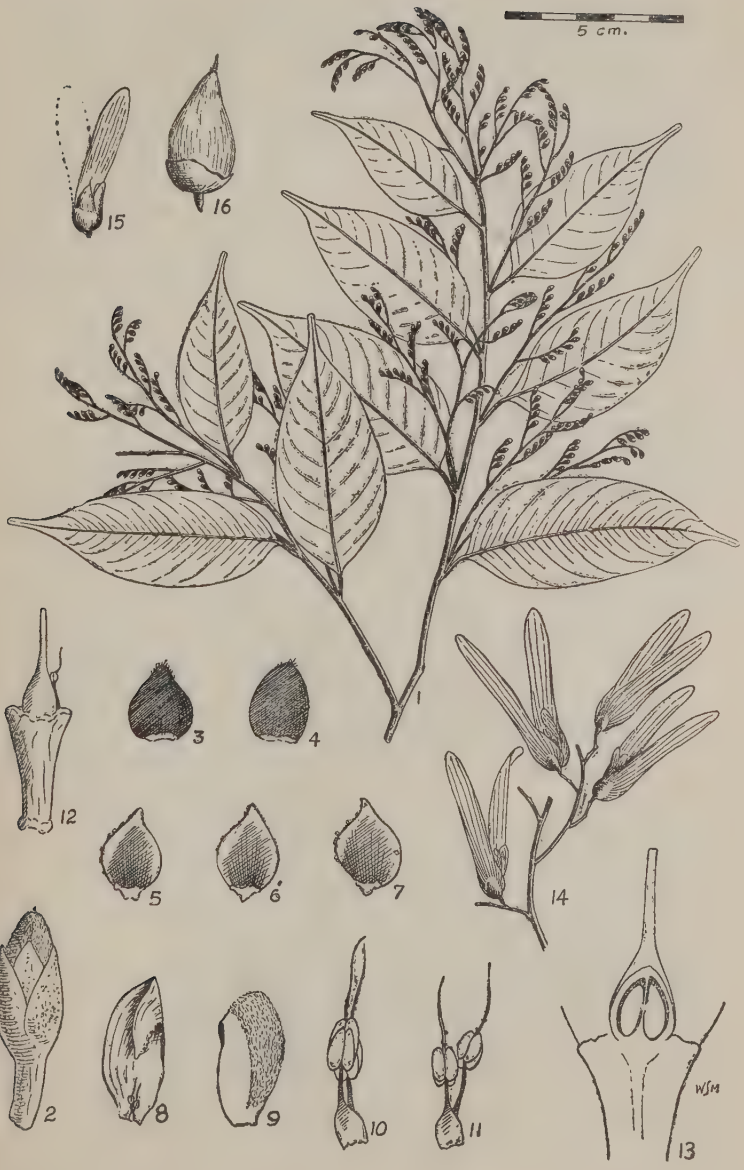
Collections examined:—
BORNEO:
LABUAN: Motley 215 (Lectotype, *sec.* Sym., of *H. micrantha* Hook. f. in Herb. Kew).
BILITON: ? Biliton Herb. No. 91 (Herb. Lugd. Bat. No. 90923–676).
BRUNEI: Forest Dept. F.M.S. 30551.
SARAWAK: Egon 00322 (Sarawak 356)

Hopea micrantha is a form of *merawan* described originally from Labuan. Many other species, mainly from Borneo and the Malay Peninsula, have from time to time been referred to *H. micrantha* in error. Among these is the tree known as *merawan meranti* in Selangor, which is described in this paper as *Hopea sulcata.* An attempt is here made to describe the true *H. micrantha* more fully, and the opinion is expressed that it does not occur in the Malay Peninsula.

Hopea sulcata Symington, **sp. nov.** *H. micrantha* sensu Foxw., Mal. For. Rec. 10: 135 (1932) partim; non H. micrantha Hook. f. sensu stricto. **Plate 20.**

H. micranthae Hook. f. (sensu stricto) valde affinis sed foliis basi cuneatis, paniculis laxioribus distincta.

Branchlets pale, minutely waxy lepidote and sparsely stellate-hairy towards the ends, decurrent leaf traces rather prominent. *Leaves* ovate- to elliptic-lanceolate, caudate-acuminate at the apex (acumen up to 1.5 cm. long, blunt), slightly unequal and usually cuneate at the base, usually about 7.0 × 4.0 cm. but considerably variable, minutely waxy lepidote, glabrous but for a few tufted domatia on the lower surface, usually drying a dull grey-green on the upper surface, yellow-brown on the lower; midrib slightly raised on both surfaces; main nerves about 10 pairs, almost invisible on the upper surface, distinct on the lower and frequently with small pore-like or tufted domatia in their axils; intermediate nerves hardly less prominent than the main nerves; reticulations invisible to the naked eye; petioles about .7 cm. long, subterete, dark or waxy-lepidote; stipules minute, caducous. *Panicles* axillary or terminal, of solitary or paired racemes, rather lax, up to 7.0 cm. long, puberulous; rachis slightly flattened; branchlets 10.0 to 17.0 mm. long, each bearing about 4 to 7 secund flowers about 1.5 mm. apart. *Flowers* ovate-oblong in bud, about 4.5 mm. long including the pedicel; pedicel 1.5 mm. long, glabrescent, drying black. *Sepals* subovate, waxy outside, sparsely ciliate along the apical margins; two outer obtuse; three inner usually shortly acuminate. *Petals* oblong, fimbriate at the apex, tomentose on the portion exposed in bud. *Stamens* 15 arranged in the usual manner in this group; filaments broad at the base, filiform in the upper half;



Hopea sulcata Sym.

anthers oblong, 4-celled, the anterior cells slightly smaller than the posterior; appendage to connective filiform, twice as long as the anther, sparsely papillose towards the base. *Ovary* ovate-conical, glabrous, tapering into an erect, cylindrical, glabrous style which is slightly longer than the ovary; stigma minute. *Fruit* glabrous; stalk about 1.5 mm. long, attached to the slight concavity formed by the enlarged sepal bases; sepals chartaceous except for the thickened, woody bases, blunt at the apex; two outer sepals about 6.0 × 1.0 cm. or slightly less, linear-oblong, auriculate at the base and slightly constricted above the auricles, about 7-nerved; three inner sepals short, usually less than 1.0 cm. long, subequal or with one considerably larger than the other two; nut ovate-conical, frequently slightly oblique, about 1.2 × 0.7 cm., glabrous, shining, minutely apiculate or crowned by the awn-like remnant of the style, closely embraced in the lower half by the imbricate sepal bases.

This species, although collected by members of the forest department and communicated to the Singapore Botanic Gardens as early as 1916, does not appear to have been considered in the *Flora of the Malay Peninsula*. The first specimens to be cited in botanical literature are referred by Foxworthy to *Hopea micrantha*.

Hopea micrantha Hook. f. was originally described from two specimens, Motley 215 (flower) and Motley 100 (sterile). As I have stated on p. 356, I consider that these differ, and am restricting the name *H. micrantha* to the flowering specimen. It is probable that the species under discussion is conspecific with Motley 100, but I am satisfied that it is distinct from Motley 215 and cannot be referred to *H. micrantha sensu stricto*. The most obvious differences are the laxer inflorescence, more prominently auriculate fruits, and cuneate leaf bases of *H. sulcata*.

Collections examined:—

MALAY PENINSULA:

PERAK: Forest Dept. F.M.S. 16203, 30347 to 30350 inclusive, 39172, 39197, 40614, 45151, 45152, 45217.

SELANGOR: Forest Dept. F.M.S. 730 (Type of *H. sulcata* Sym.); leg. ?; Sungei Lalang Forest Reserve, Kajang, Selangor; 10th June, 1916; flower.

Also—Yeop *s.n.* (tree No. 113; 5th June, 1917); Forest Dept. F.M.S. 7907, 1043, 13022, 22068, 22856, 24058, 26251, 26258, 26259, 26260 to 26265 inclusive, 26272 to 26278 inclusive, 26285, 26288, 26291 to 26294 inclusive, 26355, 26356, 26358, 26360 to 26365 inclusive, 26389, 26390 to 26393 inclusive, 26480, 26482 to 26486 inclusive, 45062, 45834, 47109.

JOHORE: S'pore Field No. 30988.

BORNEO:

LABUAN: ? Motley 100 (Syntype of *H. micrantha* Hook. f. in Herb. Kew).

Hopea sulcata is the name here given to a form of *merawan* with deeply fissured bark. It has for long been known to be abundant in the south of Sungei Lalang Forest Reserve in Selangor where it is known as *merawan meranti*. Formerly the species was thought to be identical with a Bornean species called *Hopea micrantha*.

Hopea latifolia Symington, **sp. nov.** *H. intermedia* sensu Foxw., Mal. For. Rec. 10: 134 (1932) partim; non H. intermedia King. *H. Beccariana* sensu Sym. in Gard. Bull. S.S. 93: 325 (1936) partim; non H. Beccariana Burck.

H. Beccarianae Burck habitu similis, sed foliis latioribus, basi saepissime rotundatis, acumine (breviore, fructus stylis persistentibus gracilioribus distincta. Flores ignoti.

Branchlets glabrous, drying with a silvery tinge. *Leaves* broadly elliptical, shortly blunt-acuminate at the apex, rounded or sometimes cuneate at the base, frequently slightly reflexed along the margins, about 5.0 × 2.75 cm. to 8.0 × 4.5 cm., entirely glabrous, drying light yellow-brown or greenish-yellow on both surfaces; midrib elevate on both surfaces; main nerves about 8 to 10 pairs, separated by slightly shorter and hardly less prominent intermediate nerves, slightly depressed and almost invisible on the upper surface, faint and not raised on the lower; petioles slender, about 1.5 cm. long, glabrous. *Panicles* terminal or axillary towards the ends of the branchlets, glabrous, of solitary or paired racemes not exceeding 3.0 cm. in length; branchlets up to 9.0 mm. long, 2 to 5-flowered. *Flowers* unknown. *Fruits* glabrous; stalk short and stout, about 1.5 mm. long; two outer calyx-lobes developed into wings, about 4.0 × 0.9 cm., narrow towards the woody base, about 7-nerved; three inner lobes broad, not enlarged beyond the lower half of the ripe nut; nut ovate, pointed, about 1.0 cm. long, surmounted by the thin, frequently reflexed, remnant of the style (sometimes broken off), embraced by and sometimes cemented to the sepals on the lower half.

This species is rather rare and collections are few, fruiting material only being known. The leaves very closely resemble those of the species which Foxworthy called *H. intermedia* and I consider to be *H. Beccariana* Burck, and we have both erroneously cited collections of *H. latifolia* under these names. The specimens Forest Dept. F.M.S. 8149, 41552, 5852, and 5863 should be removed from my list of collections examined on page 327 of *Gard. Bull. S.S.* 9 (1938), and enumerated here.

I have compared this species to *H. Beccariana* because in leaf venation and length of petiole they are very alike. When flowers are available, however, it is probable that

H. latifolia will be found to have a stylopodium of the *Hopea micrantha* type, *i.e.* with a long slender style, and not one of the *H. Beccariana*, "hour-glass", type. The stylar remnant on the fruits of *H. latifolia* is typical of that which develops from flowers with a slender style.

Collections examined:—

MALAY PENINSULA:

PAHANG: Forest Dept. F.M.S. 8149 (Type of *Hopea latifolia* Sym.); Forest Guard Mahamud; Telok Siseh, Kuantan, flat land; 15th January, 1928; fruit. Field notes—"vern. name, *merawan batu;* tree 60 ft high, 4 ft girth; fruits green". Also—Forest Dept. F.M.S. 49838.

MALACCA: Forest Dept. F.M.S. 41552.

JOHORE: Forest Dept. F.M.S. 5852, 5863.

Hopea latifolia Sym. is a *merawan* of the smooth-barked type which has been recorded from Kuantan in Pahang, Malacca, and Johore. In leaf it is very like *H. Beccariana* (merawan batu) with which it has been confused. The species is here described for the first time.

Hopea mengarawan Miq., Fl. Ind. Bat. Suppl. 492 (1860); Scheffer in Nat. Tijdscr. Ned. Ind.: 351 (1870); Burck in Ann. Jard. Bot. Buitenz. 6: 240 (1887) pro majore parte, excl. var. cernua; King in Journ. Asiat. Soc. Bengal 62, pt. 2: 125 (1893) in obs. sub H. micrantha; Brandis in Journ. Linn. Soc. (Bot.) 81: 70 (1895) pro majore parte; Ridl., Fl. Mal. Penins. 1: 238 (1922); Foxw., Mal. For. Rec. 10: 137 (1932).

Hopea mengarawan, although described by Miquel in 1860 from sterile material, has been subject to less confusion than any of the other early collections of the *Dryobalanoides* group of *Hopea*. The sterile type collection from Palembang is cited as *"Sumatra orient prope Muara-duwa* (Teysmann)". Among the Buitenzorg, Leiden, and Utrecht sheets of *Hopea,* which presumably contain the type specimen, there is none with this annotation, but there is a collection of Teysmann's from "Muara-enim" which bears the name *Hopea mengarawan* in Miquel's handwriting.

In 1870 Scheffer added two collections from Bangka, and one from the river Tarabangi in Lampong Province. From the last he drew a brief floral description, but erroneously stated that the stamens are 10 in number.

In 1887 Burck added another collection by Teysmann, and transferred to *H. mengarawan* a collection from Sungei Pagu which Miquel had included in his *H. dryobalanoides*. I think this was unjustified (*see* my notes under *H. dryobalanoides,* p. 346). From Borneo, Burck cited Becc. 2545 which is, in my opinion, *H. cernua* Teysm. et Binn., a species considered by Burck to be only a variety of *Hopea mengarawan*. In this he has not been supported by Brandis

or any subsequent author: I consider the two species quite distinct, although they have a similar ovary and style.

Brandis added the first Malay Peninsula collections, made by Cantley in Johore and Ridley in Singapore. But he wrongly included under *H. mengarawan*, King 8170, which is *H. pedicellata* (Brandis) Sym. and Goodenough 1447, which I consider to be *H. Beccariana* Burck. He cited another Sumatran collection, Forbes 3210, which has remarkably large flowers but closely resembles *H. mengarawan* in floral structure and leaf texture, and is probably correctly referable to it.

Ridley and Foxworthy later added more collections from the Malay Peninsula, all of which I have seen and agree are referable to this species. The Malay Peninsula specimens vary somewhat among themselves and differ from the Dutch collections in having broader, or more leathery leaves, but they are identical in flower structure, having the broad hairy ring at the base of the long style which may be seen in Teysmann's Lampong collection.

Collections examined:—

SUMATRA:

PALEMBANG: Teysmann *s.n.*, "Muara-enim" (H.B. 4022 and 938.12.10; Utrecht 035930) (? Holotype of *Hopea mengarawan* Miq.); *s.n., leg.?* (Herb. Lugd. Bat. 908353–255 and 299).

LAMPONG: Teysmann, "*ad fl.* Tarabangi" (H.B. 938.12.12; Utrecht 035929).

LOCALITY UNCERTAIN: Korthals *s.n.* (Herb. Lugd. Bat. 902146–348); Teysmann *s.n.* (Herb. Lugd. Bat. 902146–341; perhaps a duplicate of H.B. 938.12.10); Forbes 3210*a* (Herb. Lugd. Bat. 908140–1910 and 908146–226).

BANGKA: Teysmann *s.n.*, "prope Djeboes" (H.B. 3225 and 938.12.9); Teysmann *s.n.*, "Belienjoe" (H.B. 938.12.13); *s.n., leg.?*, (Herb. Lugd. Bat. 908154–37 det. *Tristania obovata*).

BILITON: Teysmann *s.n.* (H.B. 11059 and 938.12.11); van Rossum 61 (Utrecht 029954).

MALAY PENINSULA:

PAHANG: Forest Dept. F.M.S. 0721, 0734, 0735, 2638, 4621, 5481, 5742, 6540, 7941, 10015, 10554, 10572, 15636, 17145, 17238, 17245, 17249, 17261, 29556, 29608, 29978, 31679, 36039, 37324, 38010, 40675.

SELANGOR: (Cult.) Forest Dept. F.M.S. 14835.

NEGRI SEMBILAN: Forest Dept. F.M.S. 1883, 43518.

MALACCA: Forest Dept. F.M.S. 45902.

JOHORE: Cantley 205; S'pore Field No. 26139; Forest Dept. F.M.S. 6021.

SINGAPORE: Ridl. 5094, 5843, 10733, *s.n.* (Bukit Timah), *s.n.* (Grange Road); Gardens No. 2002 (H.B. 938.10.49 and 50).

Hopea mengarawan is a well-known form of *merawan* in lowlying parts of Pahang and Johore. Investigation shows that our conception of the species is correct.

Shorea atrinervosa Sym.

Shorea atrinervosa Symington, **sp. nov.** V. Sl. ex Merr., Plant. Elmer. Born. 203 (1929) in nota sub S. malibato Foxw. *Shorea collina* sensu Foxw., Mal. For. Rec. 10: 173 (1932) partim; non S. collina Ridl. *"Shorea ? inappendiculata"* Sym. ex Desch, Mal. For. Rec. 12: 9 (1936) partim; et Govt. Gazette F.M.S. Vol. 29, No. 26, Not. no. 5994, (List of Botanical and Vernacular Equivalents), p. 2 (1937) partim. **Plate 21.**

S. ciliatae King et *S. astylosae* Foxw. valde affinis sed omnibus partibus majoribus satis distincta.

Branchlets sparsely hairy at the ends, becoming dark, glabrous, and lenticellate. *Leaves* elliptic or ovate-oblong, shortly blunt-acuminate at the apex, rounded to slightly cuneate and sometimes slightly unequal at the base, about 8.0 × 4.0 cm. to 15.0 × 7.3 cm., glabrous and usually drying a dull purple-brown on the upper surface, glabrous and frequently more or less minutely pale (sometimes coppery) lepidote beneath; midrib prominent, usually drying black, slightly elevate on the upper surface, more prominently elevate beneath; main nerves 10 to 14 pairs, inconspicuous on the upper surface, prominent beneath, frequently drying black, and sometimes with small pore-like domatia in their axils on the lower surface; tertiary nerves scalariform, fine but usually visible to the naked eye on both surfaces; petioles 2.0–2.8 cm. long, glabrescent, drying black; stipules caducous (not seen), scars rather prominent. *Panicles* terminal or axillary towards the ends of the branchlets; racemes solitary, up to 14.0 cm. long, hoary stellate-hairy; branchlets regularly alternating, distichous, about 1.0 cm. apart, rather lax, up to 3.5 cm. long, hoary stellate-hairy or tomentose, 3 to 10–flowered (usually about 7). *Flowers* secund, about 3.0 mm. apart, about 15.0 mm. long in mature bud; pedicels short, stellate-tomentose. *Sepals* densely pale tomentose; three outer ovate, obtuse; two inner broadly ovate, acute. *Petals* linear, broad at the base, adpressed sericeous outside and minutely pubescent towards the apex inside, bright red at the base, pale yellow to white towards the apex (Symington). *Stamens* 25 to 31 (in flowers examined), of several heights, the innermost row being the tallest; filaments 1 to 3 times as long as the anthers, broad and flattened at the base, filamentous in the upper portion; anthers elliptical, 4-celled, the posterior cells considerably shorter than the anterior; appendage to connective rather thick, blunt, about half as long as the anther, furnished with 5 to 12 long spreading ciliæ. *Ovary* and stylopodium ovoid-conical, densely sericeous-tomentose except at the base; style short, cylindrical, glabrous, stigma minute. *Fruit:* stalk short, stout, stellate-hairy; bases of calyx-lobes woody,

sparsely hairy at the foot, closely embracing the lower half of the nut; wings glabrescent or minutely puberulous; the three outer about 8.0 × 1.4 cm., slightly narrowed towards the base, about 9-nerved; the two inner subequal, linear, 2–4 cm. long, about 4-nerved; nut ovate-orbicular; pointed, about 2.0 cm. × 1.5 cm., pale sericeous-tomentose.

This species is a typical *Eushorea,* being very similar, both in leaf texture and in flower structure, to *Shorea ciliata* King and *Shorea astylosa* Foxw., but differing in the greater size of all parts.

The earliest collections from the Malay Peninsula, Forest Dept. F.M.S. 3565 and 3566, were made in 1923. These were included in Foxworthy's conception of *S. collina.* In 1936 I confused this species with one very similar in leaf described in this paper as *Shorea lumutensis,* and enumerated them in l.c. under *"Shorea ? inappendiculata".*

Collections examined:—

MALAY PENINSULA:

TRENGGANU: Forest Dept. F.M.S. 26951, 43020.

PAHANG: Forest Dept. F.M.S. 31832 (Type of *Shorea atrinervosa* Sym.); Alwi; Bukit Goh Forest Reserve, Compt. 10; 24th Oct., 1938; flowers. Field notes—vern. name, *balau hitam;* tree 100 ft high, 7 ft 8 in. girth; flower white.

Also—Forest Dept. F.M.S. 3565, 3566, 6829, 17220, 17364, 17365, 17366, 17367, 43129, 49846, 49860, 49862.

SUMATRA:

ACHIN: bb. 2926, 8871.

WEST COAST: bb. 3762, 5484, 6118, 7040, 7693, 14955, 15465, 15466, 18360, 18600, 18602, 18623, 18711, 18720, 18729, 19320, 19333, 19348, 19389, 19474, 19498, 19501, 19502, 19504, 19623, 19661, 19662, 20306.

EAST COAST: bb. 8647.

BORNEO:

SARAWAK: Forest Dept. Sarawak A. 0587.

BRUNEI: Forest Dept. F.M.S. 28711 (?).

NORTH BORNEO: Elmer 21414.

SOUTH and EAST BORNEO: bb. 11683.

Shorea atrinervosa is the name here given to the hitherto unnamed tree called *balau hitam,* which occurs in eastern Trengganu and Pahang. In *Mal. For. Rec.* 12, and in our *List of Botanical and Vernacular Equivalents* this species was confused with *S. lumutensis,* both appearing under the heading *"Shorea ? inappendiculata".* The species appears to be common on the West Coast of Sumatra where it is frequently called *resak* or some variant of that name.

Shorea lumutensis Symington, **sp. nov.** *"Shorea ? inappendiculata,* Sym. ex Desch, Mal. For. Rec. 12: 9 (1936) partim, et Govt. Gazette F.M.S. Vol. XXIX, No. 26, Not. no. 5884 (List of Botanical and Vernacular Equivalents), p. 2 (1937) partim. **Plate 22.**

Shorea lumutensis Sym.

S. inappendiculatae Burck valde affinis sed stylis sericeo-tomentosis, petiolis longioribus differt.

Branchlets deciduous stellate-hairy at the ends, later becoming glabrous and dark. *Leaves* oblong or elliptic-oblong, acuminate at the apex, acute or truncate at the base, margins slightly sinuate, very variable in size from about 7.0 × 2.5 cm. to 29.0 × 7.0 cm., glabrous and drying a dull pale purple-brown colour (sometimes sparsely minutely scurfeous) on the upper surface, minutely grey-green scurfy-lepidote (except on the veins) on the lower surface; midrib neither conspicuously sunk nor elevate on the upper surface, prominently elevate, glabrescent, drying dark in colour, on the lower; main nerves 12 to 16 pairs, faint above, prominent and frequently drying black on the lower surface; tertiary nerves scalariform, faintly visible on the upper surface, more prominent beneath; petioles rather slender, about 2.8 in. long on an average-sized leaf, usually scurfy-lepidote on the posterior surface, glabrous and drying dark on the anterior; stipules caducous. *Panicles* terminal or axillary towards the branch ends; racemes solitary, up to 10.0 cm. long but usually less, hoary tomentose; branchlets usually about 1.0 cm. long and about 5-flowered. *Flowers* subsecund, about 9.0 mm. long in mature bud, almost sessile. *Sepals* densely pale tomentose outside; three outer ovoid-deltoid, obtuse; two inner ovoid, acute or shortly acuminate. Petals linear, broad at the base, sericeous-tomentose outside and minutely tomentose towards the apex on the inner surface, pale yellow (C.L. Carrier). *Stamens* 20 to 24 (in flowers examined), of several heights, the innermost row being the tallest; filaments rather short, the tallest not more than twice as long as the anthers, broad at the base, narrowing at the top, sometimes furnished with a few short bristles on the anterior surface; anthers elliptic-obovate, 4-celled, posterior cells smaller than the anterior, shoulders of anterior cells usually furnished with a few short bristles; appendage to connective a short blunt process usually furnished with 1 to 2 bristles (on the anterior stamens the process is erect and slightly exceeds the shoulders of the anther cells; on the posterior stamens the process is rudimentary, or at any rate much shorter, and becomes markedly reflexed as the flower matures). *Ovary* and stylopodium ovoid-conical, sericeous-tomentose except at the base, tapering gradually into the short, thick, tomentose style; stigma slightly enlarged and obscurely 3-lobed. *Fruit* sessile; bases of calyx-lobes woody, stellate-hairy, enveloping the lower third of the nut; wings puberulous; the three outer about 7.0 × 1.5 cm., narrow towards the base,

about 9-nerved; the two inner sublinear, up to 4.0 cm. long, about 5-nerved; nut subovate, tapering to a long curved beak, pale sericeous-tomentose, up to 2.0 cm. long including the beak.

This species was first detected in the field in 1931, but neither flowers nor fruits were collected until 1938–39. The close resemblances in leaf characters between this and *Shorea inappendiculata* Burck prompted me to give it the temporary name of *"Shorea ? inappendiculata"*. Now that fertile specimens have been procured it appears that the species is indeed very closely related to *S. inappendiculata* Burck. The only essential, readily definable difference is that the style of *S. lumutensis* is hairy, whereas that of *S. inappendiculata* is glabrous.*

Collections examined:—

MALAY PENINSULA:

DINDINGS (LUMUT): Forest Dept. F.M.S. 34800 (Type of *Shorea lumutensis* Sym.); C.L. Carrier; Compt. 7, Lumut Forest Reserve; 29th Dec., 1938; flowers. Field notes—"vern. name, *balau;* tree about 70 ft to first branch, 72 in. girth; flower pale yellow; immature fruit pale green".

Also—Forest Dept. F.M.S. 16808, 16809, 16840 to 16846 inclusive, 27762, 27766, 27772, 34796, 34797, 34803, 47338.

Shorea lumutensis is the name here given to a form of hard-wooded *Shorea* occurring on the coastal hills of the Dindings. In 1931, when it was first discovered, no local vernacular name could be found for it but the name *balau bukit* seems to have come into use of recent years. As, however, this name is the "preferred" name for *S. Foxworthyi,* it is suggested that we encourage the name *balau puteh* for *S. lumutensis.* In *Mal. For. Rec.* 12 this species was referred to as *"Shorea ? inappendiculata* because of its possible identity with a Bornean species, *Shorea inappendiculata* Burck.

Shorea Meadiana Symington, **sp. nov.** *"Shorea sp. nov."* Sym. ex Desch, *Mal. For. Rec.* 12: 9 (1936). **Plate 23.**

Inter species peninsulares Sectionis *Eushoreae* probabiliter *S. sumatranae* (V. Sl. ex Foxw.) Sym. maxime affinis, sed foliis minoribus, cetis appendicum paucioribus, fructu longe-alato valde distincta.

Branchlets slender, terete, minutely stellate-hairy to softly tomentose towards the ends, drying dull grey- or

* The name *Shorea inappendiculata* as well as the descriptions of Burck, and particularly Brandis, are misleading. The appendages to the connectives are actually larger than in *S. lumutensis,* while the bristles on the connectives and anther cells, although more numerous than in *S. lumutensis,* are not at all as figure by Brandis.

Shorea Meadiana Sym.

reddish-brown to black. *Leaves* ovate-, elliptic-, or oblong-lanceolate, shortly acuminate at the apex, acute or rounded and sometimes slightly unequal at the base, averaging about 8.0 ×3.4 cm. from mature trees but much larger from immature ones, thin and chartaceous in texture, glabrous and usually drying dull red-brown on the upper surface, sparsely minutely hairy on the nerves and usually drying dull greenish- or yellow-brown on the lower surface; midrib slightly sunk on the upper surface, rather prominent, striated, and sparsely stellate hairy on the lower surface; main nerves usually 9 pairs, almost invisible on the upper surface, fine but prominent and sparsely stellate-hairy beneath; tertiary nerves joining the main nerves in fine, close, parallel, curved lines, invisible above, faintly visible to the naked eye on the lower surface; petioles 1.0–1.5 cm. long, slender, slightly thickened in the upper half, minutely stellate-hairy or tomentose; stipules caducous, not seen. *Panicles* terminal or axillary towards the ends of the branchlets; racemes solitary, about half as long to as long as the leaves, minutely stellate-hairy; ultimate branchlets regularly alternating, about 5.0 mm. apart, 2 to 6-flowered. *Flowers* about 2.0 mm. apart, secund, about 10.0 mm. long in mature bud; pedicel 2.0 mm. long, tomentose. *Sepals* broadly ovate, subequal in size, tomentose outside; the three outer usually blunt; the two inner shortly, sharply acuminate at the apex. *Petals* linear, broad at the base, curved inwards along the margins when over-mature, tomentose outside, greenish-yellow (Symington). *Stamens* 28 to 32 (in flowers examined); filaments of several sizes (those of the inner row about twice as tall and 3 times as broad at the base as those of the outer), 2 to 4 times as long as the anthers, broad at the base, filamentous in the upper third; anthers ovate-elliptical, posterior cells slightly smaller than the anterior; appendage to connective slightly shorter than the anther, blunt, furnished at the apex with a solitary (rarely two) long, fine hair. *Ovary* ovate, surmounted by a thick stylopodium, sericeous-tomentose; style cylindrical, short, glabrous; stigma minute. *Fruit* winged, stalk thin but prominent, about 3.0 mm. long; bases of calyx lobes slightly thickened, embracing the lower half of the nut, puberulous; wings papery, narrow at the base, minutely puberulous; the three outer about 7.0 × 1.0 cm., about 7-nerved; the two inner, linear, up to 5.0 cm. long, 1 to 3-nerved; nut subrotundate, about 1.0 cm. across, pale sericeous-tomentose, crowned by a long, slightly curved beak about 7.0 mm. long.

This species is a typical member of the *Eushorea* group of *Shorea*. In leaf texture and flower structure it is more like *S. sumatrana* (V. Sl. ex Foxw.) Sym. than any other

species I have examined, but the fruits are of the normal winged *Shorea* type. The affinity of *S. Meadiana* with other members of the *Eushorea* group is entirely supported by the wood anatomy.

I have named the species after Mr. J. P. Mead, Director of Forestry, Straits Settlements and Adviser on Forestry, Federated Malay States, since 1929.

Collections examined:—

MALAY PENINSULA:

PERAK: Forest Dept. F.M.S. 11964, 16283, 21405, 21406, 24467, 24470, 24478, 24519, 24632, 24643, 25415, 25442, 25885, 28969, 28975, 29877, 29904, 29916, 29942, 32162, 33685, 33771, 33772, 40608, 43128.

KELANTAN: Forest Dept. F.M.S. 32820, 33290, 33425, 37844, 37974, 37976.

PAHANG: Forest Dept. F.M.S. 49845 (Type of *Shorea Meadiana* Sym.); C.F. Symington; Bukit Goh Forest Reserve, Kuantan, Pahang; 19th Nov., 1938; flower. Field notes—"Tree 4 ft 6 in. girth; bole and cut typical of a *balau*, inner bark reddish-brown; petals falling separately, greenish-yellow, broad at base, linear and revolute above, about .75 in. long; fallen flower buds also plentiful beneath tree".

Also—Forest Dept. F.M.S. 17224, 31751, 31752, 31761, 31762, 31763, 47138.

Shorea Meadiana has been collected in the Peninsula from time to time since 1928, when it was first recognized as one of the species called *damar laut kuning* in Keledang Saiong Forest Reserve in Perak. Owing to lack of flowers or good fruiting material it has not been possible to describe it until now, but it has been recognized as one of the species producing balau timber, and was referred to by Desch in *Mal. For. Rec.* 12: 9 (1936) as *"Shorea sp. nov."*. We have adopted the preferred vernacular name of *balau sengkawang*, for *Shorea Meadiana*, because the leaves are similar to those of *sengkawang*, (Shorea sumatrana), but smaller.

Shorea submontana Symington, **nom. nov.** *Shorea costata* King **(synon. nov.)** in Journ. Asiat. Soc. Bengal 62: 119 (1893); Brandis in Journ. Linn. Soc. (Bot.) 31: 81 (1895); Burkill in Journ. Str. Br. R. Asiat. Soc. 81: 67 (1920) et 86: 281 (1922); Ridley, Fl. Mal. Penins. 1: 231 (1922) partim; Foxw., Mal. For. Rec. 3: 67 (1927) et Mal. For. Rec. 10: 176 (1932) partim; Desch, Mal. For. Rec. 12: 9 (1936); non Shorea (Pterigium) costata (Correa de Serra) J. S. Preslem, Rostlinai 2: 66 (1825).

I am here renaming King's *Shorea costata* because his name is invalidated by the existence of an earlier homonym, *Shorea costata* J. S. Presl. (1825). *S. costata* J. S. Presl. is based on a plant called *Pterigium costatum* Correa de

Serra [*Ann. Mus. His. Nat. Paris* 8: 397 (1806) t. 6, fig. 1] which would appear, from the description, to be a species of *Dipterocarpus,* with which genus *Pterigium** is united by Bentham and Hooker (*Gen. Plant* 1: 191).In making the combination *Shorea costata,* Preslem cites *Pterigium costatum* Corr. and *Dryobalanops aromatica* Gaertn. f. as synonyms. It is obvious that he is wrong in uniting these species and in referring either to *Shorea* but the name *Shorea costata* J. S. Presl. is validated by the citation of these validly published names in synonymy†.

King founded his species *S. costata* in 1893, upon a single collection made by Curtis (No. 199) on Penang Hill. Brandis cited only this one collection and added nothing to our information concerning the species, except that he states that the stamens are 20 in number. Ridley cited two specimens from Penang—"Government Hill (Curtis) and Batu Feringhi".—and modified King's description. From the fact that he says "Petals nearly ovate, white, silky on both sides,, it appears that the Batu Feringhi specimen was a flowering collection of *Shorea Maxwelliana;* it may even have been a sheet of the collection upon which the species *Shorea alba* Ridl. (now reduced to *S. Maxwelliana* King) was founded.

In 1927 Foxworthy did not attempt to identify any particular collections with *S. costata,* but in 1932 he cited "with some doubt" S'pore Field No. 3476, 3495, 4316, and 4324. I agree with these citations with the exception of 3495, which I consider to be a rather large-leaved collection of *S. Maxwelliana.*

The original collection, upon which King founded his *S. costata,* bore young fruits and a few fragmentary flowers, concerning which King says—"Stamens 15, all with dilated filaments longer than the ovate anthers, those of the inner row with the apical process of the connective short and glabrous, those of the outer rows with longer ciliate apical connectives". My examination of a single flower of the same collection shows that the stamens are 20 in number and that all stamens have curved appendages about half as long as the anthers, each with 1–6 bristles. Brandis also reported 20 stamens. Unfortunately authentic flowering material has never since been collected, but the original collection is adequate to demonstrate that this species is a typical *Eushorea.* Desch's study of the wood anatomy of the species supports this conclusion.

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* Wrongly spelt *Pterygium* in some publications.

† I am very much indebted to Mr. C. E. C. Fischer of Kew for kindly looking up the references in connection with *S. costata* Presl. for me.

Until we have more adequate collections of flower and fruit of this species I shall not attempt to draw up a fuller description than that provided by King, modified by my remarks concerning the stamens. Unfortunately most of the specimens cited below are sterile and many consist only of leaves picked from the ground.

Collections examined:—

MALAY PENINSULA:

PENANG: Curtis 199 (Holotype of *S. costata* King in Herb. Kew); S'pore Field No. 3476, 4316, 4324, 4591; Forest Dept. F.M.S. 28033, 36635, 37852.

PERAK: Forest Dept. F.M.S. 16266, 24215, 25426, 25515, 25519, 25745, 25746, 25749, 25820, 28073, 28561, 28584, 28971, 28987, 28988, 29884, 32171, 32172, 32192.

SELANGOR: Forest Dept. F.M.S. 40770, 40772 to 40777 inclusive.

TRENGGANU: Forest Dept. F.M.S. 43079.

PAHANG: Forest Dept. F.M.S. 40513.

A dipterocarp, found in our high hill dipterocarp forests and producing timber of the balau grade is here considered to be the species described as *Shorea costata* by King in 1893. It is shown, however, that the name *Shorea costata* King is illegitimate according to the *International Rules of Botanical Nomenclature*, and a new name *Shorea submontana* is given to the species.

Shorea ovalis (Korth.) Bl., Mus. Bot. Lugd. Bat. 2: 33 (1852); Miq., Fl. Ind. Bat. 1, pt. 2: 503 (1859); A.DC. in DC. Prodr. 16, pt. 2: 631 (1864); Burck in Ann. Jard. Bot. Buitenz. 6: 219 (1887); Brandis in Journ. Linn. Soc. (Bot.) 31: 103 (1895); Merr., Bib. Enum. Born. Pl. 406 (1927). *Vatica ovalis* Korth. Verh. Nat. Gesch. Bot. 73 (1839–42); Walp. Repert 5: 127 (1845). *Vatica ? eximia* Miq., Fl. Ind. Bat. Suppl. 480: (1860). *Vatica ? sub-lacunosa* Miq., l.c. *Shorea eximia* (Miq.) Scheff. **(synon. nov.)**, Nat. Tijdschr. Ned. Ind. 31: 349 (1870); Burck in Ann. Jard. Bot. Buitenz. 6: 218 (1887); King in Journ. Asiat. Soc. Beng. 62, pt. 2: 121 (1893); V. Sl. ex Heyne, Nutt. Plant. Ned. Ind. ed. 2: 1116 (1927); Sym. in Gard. Bull. S.S. 7: 143 (1933) tab. 43. *Shorea sublacunosa* (Miq.) Scheff., l.c. (1870) 350. *Shorea fusca* Burck **(synon. nov.)** in l.c.: 207 (1887); Brandis in l.c. (1895) 83. *Shorea sericea* Dyer in Hook. f. Fl. Brit. Ind. 1: 306 (1872); King in l.c. (1893) 111; Brandis in l.c. (1895) 101, Becc. 2603 excl.; Ridl. in Agric. Bull. S.S. & F.M.S. 1: 58 (1901), et Fl. Mal. Penins. 1: 224 (1922); V. Sl. ex Heyne, l.c. ed. 1: 308 (1917); Burkill in Journ. Str. Br. R. As. Soc. 81: 73 (1920); Foxw., Mal. For. Rec. 1: 80 (1921), 3: 33 (1927), 8: 23 (1930), et 10: 229 (1932); ? Merr. Bib. Enum. Born. Pl. 406 (1927)

excl. Becc. 2603; V. Sl. ex Merr., Plant. Elmer. Born. 204 (1929); Edwards, Mal. For. Rec. 9: 147 (1931). *Shorea rigida* Brandis in Hook. Ic. Pl. t. 2402 (1895) et in Journ. Linn. Soc. (Bot.) 31: 102 (1895); Burkill in l.c. 76: 164 (1917) et 81: 73 (1920); Ridl. in Agric. Bull. S.S. & F.M.S. 1: 58 (1901) et Fl. Mal. Penins. 1: 223 (1922); V. Sl. ex Heyne, l.c. edit. 1: 306 (1917) et edit. 2: 1124 (1927); Foxw., Mal. For. Rec. 3: 33 (1927). *Shorea furfuracea* sensu Brandis in l.c. (1895) 98, partim; sensu V. Sl. ex Heyne, l.c. edit. 1: 299 (1917) partim; non S. furfuracea Miq. *Dilleniacea ? nervosa* in Wall. Cat. 6635 (1828–49).

I have already investigated this species in some detail in *Gard. Bull. S.S.* 7: 143 (1933), under the heading *Shorea eximia* (Miq.) Scheff., which appeared at that time to be the legitimate name for it. I have since been fortunate in having the opportunity of examining, along with Dr. van Slooten, some of the early Dutch collections which I had not seen in 1933. This examination revealed that the type specimens of *Shorea ovalis* (Korth.) Bl. and *Shorea fusca* Burck are conspecific with *Shorea eximia* (Miq.) Scheff. Unfortunately a name-change is involved as *Shorea ovalis* has priority over *Shorea eximia.*

I have made the necessary adjustments to the synonymy and citations of literature.

I should like to record here the fact that, in the Malay Peninsula, two distinct forms of this species occur. The most widely distributed form has distinctly boat-shaped leaves (*vide Gard. Bull. S.S.* 7, plate 43) and relatively slightly longer petioles than the other form, which is common on Penang island, in the north of Perak, and along the east coast of Trengganu and Pahang. This second form rarely has boat-shaped leaves, is slightly smaller in all parts, and has stipules and stipule scars which are not quite amplexicaul, as they are in the first form. But it is by no means easy to allocate all herbarium specimens to one form or the other, particularly if immature, and in essential floral and fruit characters I can see no difference.

It would be helpful if varietal names could be given to these forms, but first it is desirable that the varietal status of the important early collections should be decided. This, unfortunately, I cannot do at the moment as only a few of these collections are now available to me. It is possible that the variety *angustifolia* of *Shorea sublacunosa,* established by Scheffer, should be given recognition.

What appears to be a third variety, or form, occurs in Brunei. It has very coarsely ferrugineus-hairy branchlets, but until more complete material is available its status must be doubtful.

Collections examined:—[Additional to those cited in *Gard. Bull. S.S.* 7: 145 (1933)].

MALAY PENINSULA:

PERAK: Forest Dept F.M.S. 16812, 30812, 30822, 34202, 43450.

KELANTAN: Forest Dept. F.M.S. 32714.

SELANGOR: Forest Dept. F.M.S. 38153, 40946, 40962 to 40965 inclusive, 45838.

PAHANG: Forest Dept. F.M.S. 15622, 30135, 31526, 40316, 40442, 41017, 49847, 49848.

MALACCA: Forest Dept. F.M.S. 25221.

SUMATRA (?): *s.n., leg.?* (in Herb. Lugd. Bat. (Holotype of *Shorea fusca* Burck.).

BILITONG: Teysmann *s.n.;* van Rossum No. 66 (341) fl. + fr.

JAVA: Cult. in Hort. Bog. VII–C–21.

BORNEO:

WEST RESIDENCY: Korthals *s.n.*, Prarawing, *ex* Herb. Lugd. Bat. (Holotype of *Vatica ovalis* Korth. and *Shorea ovalis* Bl.).

NORTH BORNEO: Elmer 21507, 21784.

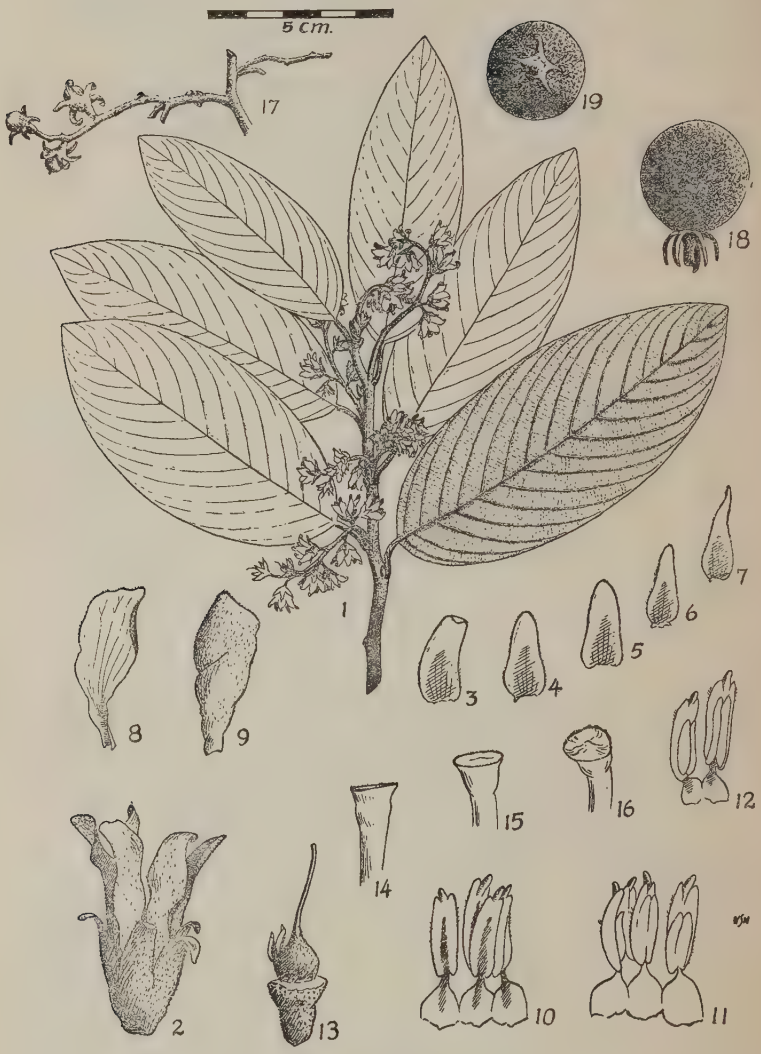
The botanical name of our *meranti kepong* is here changed from *Shorea eximia* to *Shorea ovalis.* The change is necessitated by the discovery that the first collection of the species to receive a name was given the epithet *ovalis* in 1842, eighteen years before the epithet *eximia* was applied to another collection of the same species.

Shorea rugosa var. **uliginosa** (Foxw.) Symington, **stat. nov.** "*Shorea* sp.", Foxw., Mal. For. Rec. 3: 37 (1927). *Shorea uliginosa* Foxw., Mal. For. Rec. 10: 210 et 277 (1932). *Shorea rugosa* sensu Sym. in *Gard. Bull. S.S.* 7: 132 (1933) partim, et tab. XXXV; non Shorea rugosa Heim sensu stricto.

In 1933 I investigated the Malay Peninsula species *Shorea uliginosa* Foxw. and concluded that it was identical with the earlier-described *Shorea rugosa* Heim, from Borneo. Having since had the opportunity of examining more complete material, both in the herbarium and in the field, I consider that my conclusions require modification.

Foxworthy's *S. uliginosa* is apparently identical in flower structure and in texture with *S. rugosa* Heim, but there are these constant differences—*S. uliginosa* has slightly larger leaves with relatively longer petioles, and smaller, less hairy fruits. In field characters the two forms are very similar, but *S. uliginosa* appears to occur only in peaty swamp jungle while *S. rugosa* may occur on drier land. The most useful diagnostic field character is the cupping of the leaves, which in *S. uliginosa* is very pronounced and in *S. rugosa* is rarely evident.

I think a reasonable and satisfactory way of treating the problem is to consider *S. uliginosa* Foxw. as a variety of *S. rugosa* Heim, and I have given the synonymy of *S. rugosa* var. *uliginosa* accordingly.



Parashorea densiflora V.Sl.et Sym.

Collections examined:—

Shorea rugosa Heim (sensu stricto).

BORNEO:

SARAWAK: Beccari 2638 and 2890 (Syntypes of *Shorea rugosa* Heim *ex* Herb. Beccari; iso-syntypes *ex* Herb. Kew); Forest Dept. Sarawak No. 00264.

Shorea rugosa var. *uliginosa* (Foxw.) Sym.

MALAY PENINSULA:

[Additional to these cited in *Gard. Bull. S.S.* 7: 133 (1933)].

PERAK: Forest Dept. F.M.S. 27058, 28617, 28618, 31052, 32883 to 32888 inclusive, 34103, 34104, 34105, 34108, 34109, 34155, 38001, 38120, 38131 to 38138 inclusive, 38143, 40847.

SELANGOR: Forest Dept. F.M.S. 13123, 13131 to 13134 inclusive, 13140, 17042, 29238, 29244, 29245, 29743, 30265, 41680, 41681, 46309.

BANGKA: Grashoff No. 65.

JAVA: ? Cult. in Hort. Bog. VII—C—22.

BORNEO:

SARAWAK: Haviland 2252; Sarawak Museum No. 9 and *s.n.* (Aug. 1908).

The Malay Peninsula tree called *meranti bakau* was named *Shorea uliginosa* Foxw. in 1932. In 1933 I considered that our species was identical with the earlier described *S. rugosa* Heim, but examination of more material has induced me to change my opinion. Our tree is very closely related to the Bornean *S. rugosa* but there are slight, definable differences; the most satisfactory arrangement seems to be to treat *S. uliginosa* as a variety of *S. rugosa*. Thus our *meranti bakau* becomes *Shorea rugosa* var. *uliginosa* (Foxw.) Sym.

Parashorea densiflora van Slooten et Symington, **sp. nov.**

Parashorea aptera sensu Foxw., Mal. For. Rec. 10: 243 (1932); non P. aptera V. Sl. in Bull. Jard. Bot. Buitenz. III, 8: 377 (1927) **Plate 24.**

P. apterae V. Sl. similis, sed foliis tomentosis, fructus calycis laciniis reflexis satis distincta.

Branchlets pale fulvous tomentose towards the ends, later glabrous and dark. Leaves usually elliptic- or oblong-lanceolate, acute or acuminate at the apex, rounded at the base or sometimes unequal, one side being cuneate, about 11.0 × 4.75 cm. but considerably variable, glabrous and drying greenish-yellow on the upper surface, fulvous scabrous stellate-tomentose on the lower; midrib inconspicuous above, prominent and stellate-hairy beneath; main nerves about 12 to 16 pairs, faint above, prominent and hairy beneath, joined by conspicuous scalariform reticulations; petioles about 12.0 mm. long, rugose, tomentose; stipules caducous (not seen), leaving small triangular scars. *Panicles* terminal or in the axils of the uppermost leaves,

short and dense (2.0–6.0 cm. long), the branchlets only a few mm. long and few-flowered. *Flowers* about 9.0 mm. long, sessile or shortly stalked, subtended by caducous bracteoles; pedicel, calyx, and petals pale tomentose on the exposed portions. *Sepals* tomentose outside; three outer ovate-oblong, obtuse; two inner slightly smaller and acuminate. *Petals* rather broad, narrow at base, said to be "yellow outside, purple inside" (Forest Dept., F.M.S. 12680). *Stamens* 15, in three rows, the inner row slightly taller than the two outer rows which are subequal; filaments short, flattened, broad at base, narrowing abruptly; anthers oblong, about twice as long as the filaments, the outer cells longer than the inner and furnished with a few (sometimes tufted) setae; appendage to connective short and blunt, prolonged slightly beyond the apex of the outer anther cells. *Ovary* ovate-rotundate, hairy, the apex prolonged into a long, filiform, glabrous style, stigma discoid, apparently ringed with minute hairs, obscurely lobed. *Fruit* a 5-lobed, globose nut: stalk up to 7.0 mm. long, smooth or sparsely stellate-hairy; calyx-lobes usually 5 (sometimes 6 or 4), valvate, subequal, woody, oblong, up to 12 mm. long, slightly or markedly reflexed, glabrous when mature; nut free, globose, about 3.0 cm. across when mature, minutely apiculate, verrucose. *Seedlings* have linear leaves, and saplings large, glabrous, glaucous, long-petioled leaves characteristic of *Parashorea.*

This species, which was first collected in 1925, was referred by Foxworthy, in 1932, to van Slooten's *Parashorea aptera.* Undoubtedly it is a close relative of that species, but it differs markedly in the smaller, more tomentose leaves, and the reflexed fruiting calyx-lobes (flowers of *P. aptera* V. Sl. are not known). I am indebted to Dr. van Slooten for confirming my suspicion that our species is distinct, and for suggesting the name *Parashorea densiflora.*

In addition to the specimens cited below we have several collections, mainly from eastern Pahang, which differ from typical *P. densiflora* in the glabrous leaves, and in some other respects. These may represent a separate species, but until adequate herbarium material is available I shall refer to them as "the glabrous form of *P. densiflora*".

Collections examined:—

MALAY PENINSULA:

SELANGOR: Forest Dept. F.M.S. 12845, 13302, 18161, 23100, 23336, 24059, 24172, 29458, 29459, 30056, 30057, 32158, 32378.

NEGRI SEMBILAN: Forest Dept. F.M.S. 12680 (Type of *P. densiflora* V.Sl. et Sym.) E. A. Strouts; Senaling Inas Forest Reserve; March 17th, 1927; flower (first consignment) and young fruits (second consignment). Field note—"flower yellow outside, purple inside".

Also—Forest Dept. F.M.S. 10343, 26620, 42754, 42966.

PAHANG: Forest Dept. F.M.S. 40422.

Parashorea densiflora is the name here given to our *meranti pasir*. Formerly the species was confused with *Parashorea aptera*, a closely related species described from Sumatra, but so far not recorded from the Malay Peninsula.

Parashorea globosa Symington, **sp. nov.**

P. densiflorae V. Sl. et Sym. probabiliter affinis, sed foliis fructibusque majoribus differt.

Branchlets rather coarse, coarsely yellow stellate-tomentose towards the ends. *Leaves* ovate to elliptic-oblong, rounded or subcordate at the base, bluntly acuminate at the apex, about 12.0 × 7.0 cm. to 20.0 ×9.0 cm., glabrescent and drying a pale yellow or greenish tinge on the upper surface, densely golden tomentose or sparsely hairy and glaucescent beneath; midrib slightly depressed and hairy above, prominent and coarsely stellate-hairy beneath; main nerves 16 to 20 pairs, faint on the upper surface, prominent and stellate-hairy beneath; reticulations scalariform, prominent and hairy on the lower surface; petioles coarse, rugose, tomentose, thickened above, about 1.5–2.0 cm. long. *Inflorescence* and *flowers* unknown. *Fruit:* stalk stout, 3.0 mm. long; nut globose, verrucose, about 4.0 cm. across, free; calyx lobes 5 (or 6), valvate, subequal, linear-oblong, 1.0–2.0 cm. long, not reflexed. *Seedlings leaves* very large, peltate, acuminate, silvery beneath, with long slender petioles.

This species is very imperfectly known. Flowers have never been collected, and the only fruits to be found had so rotted on the ground that they broke into fragments shortly after collection. Its leaves are very like those of *Parashorea densiflora* V. Sl. et Sym., but much larger. They closely resemble those of *Parashorea Buchananii* (Fischer) Sym. (**comb. nov.** = *Shorea Buchananii* Fischer), but they are much more hairy.

Collections examined:—

MALAY PENINSULA:

PERAK: Forest Dept. F.M.S. 16823 (Type of *P. globosa* Sym); D.B. Arnot; Bruas Forest Reserve, flat land beside swamp; 24th March, 1935; sterile. Field note—"Tree 70 ft high, 9 ft 6 in. girth".

Also—Forest Dept. F.M.S. 16272, 16819, 16824, 16825, 24642, 25414, 25645, 43598 (fruit).

Parashorea globosa is the name here given to a rather rare tree which is known to occur in valleys on the east of the Keledang Saiong Forest Reserve, and in the north west of Bruas Forest Reserve in Perak. In leaves and

fruits it resembles *meranti pasir* (Parashorea densiflora) but all parts are larger. No recognized vernacular name is known but the name *meranti pasir daun besar* has been coined.

Shorea leptoclados Symington, **sp. nov.** *Shorea polysperma* sensu Keith, N.B. For. Rec. 2 (Prelim. List N.B. Pl. Names) : 238 (1938) ; non S. polysperma (Blco.) Merr. **Plate 25.**

S. polyspermae (Blco.) Merr. valde affinis sed foliis latioribus basi obtusis differt.

Branchlets rather fine, cinereous and minutely stellate-hairy towards the ends, later black and glabrescent. *Buds* prominently stalked. *Leaves* elliptical, shortly blunt-acuminate at the apex, rounded at the base, about 9.0 × 4.25 cm. to 16.0 × 8.0 cm., glabrous or sparsely minutely stellate-hairy above, minutely stellate-hairy on the veins on the undersurface, usually drying ash-grey or grey-brown in colour; midrib slightly depressed above, prominent and stellate-hairy beneath; main nerves 9 to 15 pairs, faint above, fine but conspicuous on the lower surface, usually with domatia in the axils of the two lowest pairs; tertiary nerves joining the main nerves in very fine, more or less parallel, wavy lines, usually invisible to the naked eye on the upper surface; petioles slender, about 1.75 cm. long, minutely stellate hairy, drying black or cinereous; stipules linear, up to 2.0 cm. long, caducous, leaving rather prominent scars. *Panicles* terminal or in the axils of the youngest leaves, solitary, slightly shorter than the leaves, very slender, minutely stellate-hairy to cinereous-tomentose towards the ends; branchlets slender, sometimes zig-zag, up to 4.0 cm. long, 3 to 17-flowered (usually about 9), arranged at intervals of about 1.0 cm. and each subtended by linear-oblong, minutely tomentose, subpersistent, stipular bracts. *Flowers* subtended by ovate, minutely tomentose, slightly imbricate, paired bracteoles, secund, ovate-lanceolate and about 8.0 mm. long in bud, closely set, "grey" (38841), "yellow ochre" (36724), "white" (38861). *Sepals* subovate, rounded or subacute at apex, the three outer slightly larger than the two inner, densely pale stellate-tomentose outside, minutely tomentose on the apical portion inside. *Petals* linear-oblong, sericeous tomentose on the portions exposed in bud. *Stamens* 15, arranged in three rows in the normal manner; filaments broad and flattened at the base, abruptly narrowing to the filamentous upper half; anthers elliptical-oblong, shorter than the filaments, 4-celled; appendage to connective filiform, as long as the

Shorea leptoclados Sym.

filament and anther, sometimes minutely papillose. *Ovary* subglobose, densely tomentose except at the base; style filiform, erect, about twice as long as the ovary; stigma minute. *Fruit* 5-winged, (immature specimens only seen); almost sessile; bases of accrescent sepals embracing the entire nut, woody, sparsely minutely stellate-hairy; wings thin, puberulous; three outer 6.0–12.0 cm. long by about 1.4 cm. broad, about 10-nerved; two inner wings narrow, up to about 5.0 cm. long; nut ovate, about 1.0 cm. long, constricted near the apex, crowned with the thin stylar remnant, pale sericeous-tomentose.

Shorea leptoclados is very closely related to *S. pauciflora* King and *S. polysperma* (Blco.) Merr. All three are very similar in vegetative characters, while the flower and fruit structure is essentially the same. *S. pauciflora* is, however, distinguishable from the other two by its minutely setose antherine appendages. *S. polysperma* differs from *S. leptoclados* in having more lanceolate leaves, which are frequently scurfy-lepidote, and in the more densely tomentose panicle. It seems probable that the most reliable diagnostic character will be revealed after comparison of the floral bracts, but the material available to me is hardly adequate for definition of the differences.

Other related species, less liable to be confused with *S. leptoclados*, include *S. palembanica* Miq., *S. Kunstleri* King, *S. platyclados* V.Sl., *S. singkawang* Miq., *S. inaequilateralis* Sym., and several undescribed Bornean species. These form a natural group which corresponds closely to Heim's Section *Brachyptera*. For convenience I shall in future refer to this group as the "*Brachyptera* Group" as the name *Brachyptera* will probably eventually have to be adopted, although it is admittedly not very appropriate.

Collections examined:—

MALAY PENINSULA:

JOHORE: Forest Dept. F.M.S. 35758, 35759.

BORNEO:

BRUNEI: Forest Dept. F.M.S. 30533 (Type of *S. leptoclados* Sym.); J. S .Smith; Sungei Batu Apoi, river bank; 22nd April, 1935; flower. Field notes—"Vern. name *serigawan plandok* (Murut); tree 100 ft high, 5 ft girth; bark purplish, smooth (very variable it seems)". Also—Forest Dept. F.M.S. 30529, 35672, and 39605.

NORTH BORNEO: Forest Dept. F.M.S. 36724 (S.H. 3947), 38776 (S.H. 4400), 38804 (S.H. 4428), 38841 (S.H. 4465), 38861 (S.H. 4485), 39005 (S.H. 4629).

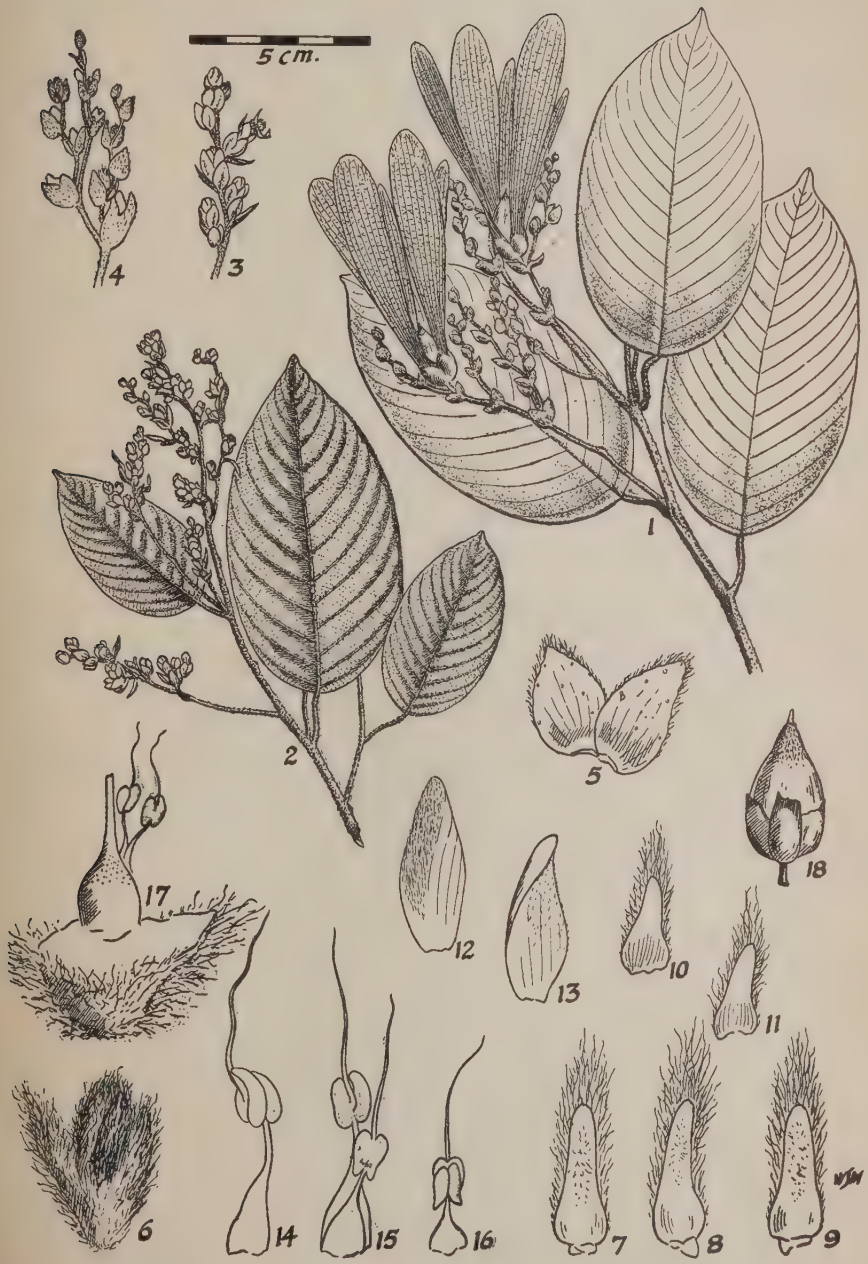
The tree here described as *Shorea leptoclados* is well-known in North Borneo as *majau*. In Brunei it has been recorded under the name of *seringawan plandok*, and in the

Malay Peninsula it has recently been located in Panti Forest Reserve where it is given the name *meranti pepijat*. Botanically it is closely related to *tanguile* (S. polysperma) of the Philippines, and *nemesu* (S. pauciflora) which is well-known in the Malay Peninsula. It produces light red meranti timber. In the field it is readily recognizable by its greyish-coloured bole and outer bark shedding in thin papery flakes.

Shorea Flemmichii Symington, **sp. nov. Plate 26.**

S. Gysbertsianae Burck et *S. stenopterae* Burck, inter alia, probabiliter affinis, sed indumento ramulorum foliorumque scaberrimo, bracteis persistentibus parvis, floribus lanuginosis, omnibus partibus minoribus valde distincta.

Branchlets rather thin but coarsely, fulvous, scabrous stellate-hairy. *Leaves* elliptical or ovate-elliptical, acute or shortly acuminate at the apex, rounded or subcordate at the base, about 8.0 × 3.4 cm. to 11.0 × 5.5 cm., margins sometimes slightly revolute, deciduous stellate-hairy and drying reddish-brown on the upper surface, scabrous fulvous stellate-tomentose on the lower; midrib slightly depressed and tomentose on the upper surface, prominent and scabrous beneath; main nerves 14 to 20 pairs, very faint above but prominent and scabrous beneath; nervules joining the main nerves in wavy, more or less parallel, lines, almost invisible above, marked by rows of stellate hairs on the lower surface; petioles about 1.5 cm. long, scabrous, fulvous stellate-hairy. *Panicles* terminal or in the axils of the upper leaves, of solitary racemes up to about 8.0 cm. long, fulvous, scabrous stellate-tomentose; branchlets subtended by 3-fid bracts, up to 2.5 cm. long and rather prominently zig-zag when mature, each bearing 3 to 5 distichous flowers. *Flowers* subsessile, about 5.0 mm. long in bud, each subtended by imbricate, paired bracteoles; bracteoles ovate, acute, irregularly crenate at the margins, about 5.0 mm. long, lanate-hairy on the outer surface, sparsely gland-dotted, persistent. *Sepals* ovate-linear-oblong, lanate-tomentose, the three outer about twice as long as the two inner. *Petals* oblong, lanate-tomentose outside, minutely tomentose on the inner surface. *Stamens* 15, in three rows; filaments broad and flattened at the base, narrow in the upper half, two to three times as long as the anthers; anthers oblong-globulose, the 4 cells subequal; appendage to connective filiform, rather longer than the filament and anther. *Ovary* and stylopodium ovate-conical, minutely glandular-papillose in the upper portion; style erect, cylindrical, glabrous, about as long as the ovary and stylopodium;



Shorea Flemmichii Sym.

Dryobalanops Keithii Sym.

stigma minute. *Fruit* 5-winged; stalk 2.5 mm. long, lanate-hairy; bases of accrescent sepals embracing the lower third of the nut, slightly thickened, sparsely lanate-hairy at the base; wings papery, glabrous; three outer spathulate, obtuse, about 7.0 × 1.7 cm., about 9-nerved; two inner 5.0 to 6.0 cm. long, sometimes pointed at the apex, about 7-nerved; nut ovate-conical about 1.7 × .9 cm., sericeous-tomentose towards the apex which is surmounted by the thin, glabrous style about 2.0 mm. long.

I have likened this species to *S. Gysbertsiana* Burck and *S. stenoptera* Burck because of certain floral resemblances, but I do not pretend to believe that there is a very close relationship. Indeed, I have examined no dipterocarp with which *S. Flemmichii* is obviously closely related, but it belongs to that large heterogeneous group of *Shorea*, members of which have usually been referred to the section *Pinanga* Brandis.

I have named the species after Mr. C. O. Flemmich who has been State Forest Officer in Brunei since 1936 and has collected a large amount of excellent herbarium material from the trees in his state.

Collections examined:—

BORNEO:

BRUNEI: Forest Dept. F.M.S. 32585 (Type of *S. Flemmichii* Sym.); C. O. Flemmich; Bukit Ratan, Tenajor, Belait, hill slope; 21st March, 1938; flower buds. Field notes —"vern. name *meranti;* tree 120 ft high, 15 ft girth; flower immature".

Also—Forest Dept. F.M.S. 34576, 35540, 48110.

Shorea Flemmichii is the name here given to a new Brunei species which has been collected in hilly jungle at Tenajor, Pak Gabah, at Pangkalan Ran on the Tutong River, and in the Labi Hills Forest Reserve. The species, which is of considerable botanical interest, is remarkable in the field for its very thick, deeply-fissured bark. We were told that the Dyak name for the tree is *kayu raya*. The timber, as far as may be judged from a small sample, is a superior quality dark red meranti.

Dryobalanops Keithii Symington, **sp. nov. Plate 27.**

A congeneribus foliis multo majoribus valde distincta; fructibus iis *D. fuscae* V. Sl. subsimilibus.

Branchlets rather coarse, smooth, drying dark purple-brown, prominently sparsely lenticellate; decurrent leaf traces and triangular stipular scars conspicuous. *Leaves* oblong, slightly broader towards the apex than at the base, about 20.0 × 6.5 cm. to 40.0 × 11.0 cm.; apex acuminate, acumen about 1.0 cm. long; base cordate; margins tending

to be recurved at the base; glabrous, drying a light yellow or reddish-brown on both surfaces; midrib sunk on the upper surface, prominent and rounded on the lower; main nerves about 30 pairs, separated by one slightly shorter but hardly less prominent intermediate nerve and several shorter ones, joining to form a prominent intramarginal nerve close to the leaf margin, very faint on the upper surface but prominent on the lower; petioles about 1.0 cm. long, thick, rugose, and dark when dry. *Panicles* glabrous, apparently of solitary racemes about half as long as the leaves, furnished with caducous bracts and semi-persistent, paired bracteoles which subtend the flowers. *Flowers* unknown. *Fruits* (immature) winged, glabrescent; stalk about .5 cm. long; 5 calyx lobes equal, elliptic-obovate, about 4.5 × 2.3 cm., obtuse at the apex, about 14-nerved; nut subglobose, about 1.0 cm. long, sparsely hairy towards the apex, crowned by a tapering style about 0.4 cm. long.

Only immature fruits are known, but the species has such large and distinctive leaves that it can be described with confidence. Any further evidence of the generic position of the plant considered necessary is provided by the timber, which Mr. Desch, who has kindly examined it for me, reports to be typical of *Dryobalanops*.

I have named the species after Mr. H. G. Keith, Conservator of Forests, North Borneo, whose botanical collections are well-known to botanists interested in the flora of Borneo.

Collections examined:—

BORNEO:

North Borneo: Forest Dept. F.M.S. 44382 (S.H. 9070) (Type of *Dryobalanops Keithii* Sym.); H. G. Keith (Kalabakang-Kwamut Expedition); Tiaggau, edge of streams; 6th June, 1938; immature fruits. Field notes —"Vern. names *mampahit, gempait;* tree 40 ft high, 30 in. girth; fruits yellow-green, 5-winged similar to *kapur;* wood probably sold as *keruing*, sinking timber." Also—Forest Dept. F.M.S. 44381 (S.H. 9069).

Dutch South and East Borneo: bb. 17813, 18159.

The species here described as *Dryobalanops Keithii* appears first to have been collected by collectors of the Netherlands Indies Forest Department in Dutch East Borneo, in 1930, under the name of *malampait*. The first fertile collection was made in 1938 by Mr. Keith in North Borneo, where the tree is known as *gempait* or *mampahit*.

Corrigenda

Gard. Bull. S.S. 7, pt. 2 (1933), p. 143, under "Collections examined, Borneo"—add Beccari 2960.

l.c., p. 150, top line—"Beccari 2960" should be deleted. On examination of the Milan

sheet of this collection I see that it is actually *S. gibbosa* Brandis, although Brandis included it under *S. Faguetiana*. Heim based *S. Faguetiana* on Becc. 3039 and 2954 which are the syntypes; Becc. 2566 and 2960 were added later by Brandis.

Gard. Bull. S.S. 8, pt. 1 (1934), p. 4, second last line—for "6 cm.", read "4 to 5 cm."

l.c., p. 23, under "Collections examined, Siam" —delete C.F. 3761, 3835, 3863, and 3874. These sterile specimens all belong, I think, to *Hopea minutiflora* Fischer which is closely related to *H. sangal* Korth.

l.c., p. 26, line 3—delete "Type of young fruit".*

l.c., p. 26, line 6—for "Type of flower", read "Type of *Hopea semicuneata* Sym.".

l.c., p. 36, line 4—after No. 1343, insert "(Type of *Vatica dulitensis* Sym.)".

l.c., p. 40, second last line—for "drawings of flower parts" etc., substitute "(Drawings of 1 and flower parts based on Richards 1343; 2, 13, and 14 on Richards 2543)"

Gard. Bull. S.S. 8, pt. 4 (1935), p. 266, middle of page—for "*Shorea melaanonan* Bl.", read "*Shorea malaanonan* Bl."

l.c., p. 270, line 3—for "Type of flower", read "Type (flower)".

l.c., p. 270, line 6—for "Type", read "Paratype".

l.c., p. 274, line 7—for "Type", read "Paratype".

l.c., p. 274, line 8—for "Type of flower", read "Type (flower)".

l.c., p. 278, para. 3, line 3—for "Type of flower", read "Type".

l.c., p. 278, para. 3, second last line—for "Type", read "Paratype".

l.c., p. 283, para. 3, line 2—for "Type", read "Paratype".

* In some of my earlier descriptions I have been somewhat ambiguous in designating the TYPE SPECIMEN. To avoid such ambiguity in future, I propose to employ, when it seems desirable to do so, the nomenclature of types proposed by Furtado in *Gard. Bull. S.S.* 9: 285–308 (1937).

l.c., p. 283, para 4, line 1—for "Type of flower", read "Type".
l.c., p. 285, para. 3, line 1—for "Type", read "Paratype".
l.c., p. 285, para. 3, line 1—for "Type of flower", read "Type".
l.c., p. 287, para. 2, line 1—for "Type of flower", read "Type".
l.c., p. 287, para. 3, line 1—for "Type", read "Paratype".
l.c., p. 288, last line—for "Type of flower", read "Type".

Gard. Bull. S.S. 9, pt. 4 (1938), p. 344, line 9—for "5.0 cm.", read "5.0 mm.".

EXPLANATION OF PLATES

Plate 11. **Hopea minima** Sym. var. **penangiana** Sym. 1, flowering twig. 2, part of branchlet of panicle with two flower buds. 3, end of branchlet of panicle with expanding flower. 4 and 5, outer sepals. 6, 7, and 8, inner sepals. 9 and 10, petal from mature flower. 11, 12, and 13, stamens. 14, ovary. 15, end of branchlet of panicle showing paired bracteoles. 16, section through ovary. 17, fruiting branchlet. 18, fruit. 19, undersurface of leaf enlarged to show veination. (Drawings based on Curtis 1406). *Scale applies to 1 and 17 only.*

Plate 12. **Hopea subalata** Sym. 1, flowering twig. 2, branchlet of panicle showing paired bracteoles. 3, flower bud. 4, expanding flower. 5 and 6, outer sepals. 7, 8, and 9, inner sepals. 10 and 11, petal from mature flower. 12, 13, and 14, stamens. 15, ovary. 16, fruiting panicle. 17, enlarged fruit. (Drawings of 1 and flower parts based on Forest Dept. F.M.S. 13045; 16 and 17 on Forest Dept. F.M.S. 24921). *Scale applies to 1 and 16 only.*

Plate 13. **Hopea sublanceolata** Sym. 1, flowering twig. 2, branchlet of panicle and flower bud. 3, mature flower. 4, part of branchlet of panicle showing bracteoles. 5 and 6, outer sepals. 7, 8, and 9, inner sepals. 10 and 11, petal from flower bud. 12, stamens. 13, ovary. 14 and 15, fruits. (Drawings of 1 and flower parts based on Forest Dept. F.M.S. 30808; 14 on Forest Dept. F.M.S. 42292; 15 on Forest Dept. F.M.S. 12070). *Scale applies to 1, 14, and 15 only.*

Plate 14. **Hopea Griffithii** Kurz. 1, flowering twig. 2, branchlet of panicle with flower. 3, flower bud. 4, expanded flower. 5 and 6, outer sepals. 7, 8, and 9, inner sepals. 10 and 11, stamens. 12 and 13, petal from mature bud. 14, ovary. 15, fruiting twig. 16, fruit showing nut. (Drawings of 1 and flower parts based on Ridl. 4738; 15 and 16 on Forest Dept. F.M.S. 17402). *Scale applies to 1 and 15 only.*

Plate 15. **Hopea dryobalanoides** Miq. 1, flowering twig. 2, branchlet of panicle with flowers in three stages. 3 and 4, outer sepals. 5, 6, and 7, inner sepals. 8 and 9, petal from mature, flower. 10, 11, 12, and 13, stamens. 14, ovary. 15, section through ovary. 16, branchlet with immature fruits. 17 and 18, mature fruits. (Drawings of 1, 2, and flower parts based on Forest Dept. F.M.S. 625; 16 on Forest Dept. F.M.S. 23794; 17 and 18 on Forest Dept. F.M.S. 17345). *Scale applies to 1, 16, 17, and 18 only.*

Plate 16. **Hopea myrtifolia** Miq. 1, flowering twig. 2, immature twig. 3, flower bud. 4 and 5, outer sepals. 6, 7, and 8, inner sepals. 9 and 10, petal from mature bud. 11, 12, and 13, stamens. 14, 15, and 16, ovary and stylopodium. 17 and 18, mature fruits. (Drawings of 1 and flower parts based on Forest Dept. F.M.S. 41016; 2 on Miq. *s.n.*; 17 and 18 on Forest Dept. F.M.S. 41915). *Scales applies to 1, 2, 17, and 18 only.*

Plate 17. **Hopea ferruginea** Parijs. 1, flowering twig. 2, branchlet of panicle with young flower bud. 3, mature flower bud. 4 and 5, outer sepals. 6, 7, and 8, inner sepals. 9 and 10, petal. 11 and 12, stamens. 13, ovary. 14, end of style and stigma. 15, branchlet with mature fruits. 16, nut of mature fruit. (Drawings of 1, 2, and flower parts based on Forest Dept. F.M.S. 25285; 15 and 16 on Forest Dept. F.M.S. 9510). *Scale applies to 1 and 15 only.*

Plate 18. **Hopea Dyeri** Heim. 1, flowering twig. 2, flower bud. 3, branchlet of panicle. 4 and 5, outer sepals. 6, 7, and 8, inner sepals. 9 and 10, petals. 11, 12, and 13, stamens. 14, ovary and stylopodium. 15, fruiting twig. 16, nut of mature fruit. (Drawings 1 to 14 based on Forest Dept. F.M.S. 48026; 15 and 16 on Forest Dept. F.M.S. 1907). *Scale applies to 1 and 15 only.*

Plate 19. **Hopea micrantha** Hook. f. 1, flowering twig. 2 and 3, flower buds. 4, 5, and 6, inner sepals. 7 and 8, outer sepals. 9 and 10, petal from flower bud. 11 and 12, stamens. 13, ovary. 14, section through ovary. 15, fruits (slightly immature). 16, fruit with wings removed. (Drawings of 1 and flower parts based on Motley 215; 15 and 16 on Igon 322). *Scale applies to 1 and 15 only.*

Plate 20. **Hopea sulcata** Sym. 1, flowering twig. 2, flower bud. 3 and 4, outer sepals. 5, 6, and 7, inner sepals. 8 and 9, petal from flower bud. 10 and 11, stamens. 12, ovary. 13, section through ovary. 14, branchlet with fruits. 15, mature fruit showing nut. 16, nut from mature fruit. (Drawings of 1 and flower parts based on Forest Dept. F.M.S. 730; 14 on Forest Dept. F.M.S. 7907; 15 and 16 on Forest Dept. F.M.S. 43359). *Scale applies to 1, 14, and 15 only.*

Plate 21. **Shorea atrinervosa** Sym. 1, flowering branchlet. 2, end of branchlet of panicle with flowers in different stages. 3 and 4, inner sepals. 5, 6, and 7, outer sepals. 8 and 9, petal from mature flower bud. 10 and 11, stamens. 12, flowers with perianth parts removed to show ovary. 13, section through ovary. 14 and 15, fruits. 16, nut. (Drawings of 1, 2, and flower parts based on Forest Dept. F.M.S. 31832; fruits on Forest Dept. F.M.S. 49862). *Scale applies to 1, 14, and 15 only.*

Plate 22. **Shorea lumutensis** Sym. 1, branchlet with flowers and young fruits. 2, flower bud. 3, 4, and 5, outer sepals. 6 and 7, inner sepals. 8 and 9, petal from flower bud. 10, petal from mature flower. 11 and 12, immature stamens. 13 to 16, mature stamens. 17, flower with perianth parts removed. 18, stigma. 19, section through ovary. 20, branchlet with mature fruits. 21, nut. (Drawings of 1 and flower parts based on Forest Dept. F.M.S. 34800; 20 and 21 on Forest Dept. F.M.S. 47338). *Scale applies to 1 and 20 only.*

Plate 23. **Shorea Meadiana** Sym. 1, flowering twig. 2, branchlet of panicle with flowers. 3, 4 and 5, outer sepals. 6 and 7, inner sepals. 8 and 9, petal from mature flower bud. 10 and 11, stamens. 12, ovary. 13, section through ovary. 14, petal fallen from mature flower. 15, mature fruit. 16, 15 with wings removed. (Drawings of 1, 2, and flower parts based on Forest Dept. F.M.S. 49845; 15 and 16 on Forest Dept. F.M.S. 47138). *Scale applies to 1 and 15 only.*

Plate 24. **Parashorea densiflora** V.Sl. et Sym. 1, flowering twig. 2, flower. 3 to 7, sepals. 8 and 9, petal. 10, 11, and 12, stamens. 13, ovary. 14, 15 and 16, stigmas. 17, panicle with young fruits. 18 and 19, mature fruits. (Drawings of 1 to 17 based on Forest Dept. F.M.S. 12680; 18 and 19 on Forest Dept. F.M.S. 10343). *Scale applied to 1, 17, 18, and 19 only.*

Plate 25. **Shorea leptoclados** Sym. 1, flowering twig. 2, young panicle showing bracts. 3, bract removed from 2. 4, branchlet of young panicle (later stage) showing bracteoles. 5, flower bud. 6, outer sepal. 7, inner sepal. 8 and 9, petals from flower bud. 10, stamens. 11, appendage to connective (much magnified). 12, flower with sepal and petals removed. 13, ovary. 14, upper part of style with stigma. 15 and 16, immature fruits. 17, nut from immature fruit. (Drawings of 1 and flower parts based on Forest Dept. F.M.S. 30533; 2, 3, and 4 on Forest Dept. F.M.S. 38776; 15 on Forest Dept. F.M.S. 39005; 16 and 17 on Forest Dept. F.M.S. 39605). *Scales applies to 1 to 4, 15, and 16 only.*

Plate 26. **Shorea Flemmichii** Sym. 1, twig with flowers and fruits. 2, young flowering twig. 3, part of young flowering panicle. 4, part of mature panicle from 1. 5, imbricate bracteoles subtending a flower. 6, flower bud. 7, 8, and 9, outer sepals. 10 and 11, inner sepals. 12 and 13, petal from mature bud. 14, 15, and 16 stamens. 17, ovary. 18, mature fruit (wings removed). (Drawings of 1, 4, 18, and flower parts based on Forest Dept. F.M.S. 48110; 2 and 3 on Forest Dept. F.M.S. 32585). *Scale applies to 1 and 2 only.*

Plate 27. **Dryobalanops Keithii** Sym. 1, fruiting branchlet. 2, leaf from young tree. 3, immature fruit (two sepals removed). 4, 3 with all sepals removed. (Drawings of 1, 3, and 4 based on Forest Dept. F.M.S. 44382; 2 on Forest Dept. F.M.S. 44381). *Scale applies to 1, 2, and 3 only.*

INDEX

Names of groups especially considered in this paper are shown in **bold type** and synonyms in *italics*.

Balanocarpus bracteatus (Burck) Merr. 337
Balanocarpus bracteatus sensu Foxw. 337
Balanocarpus Curtisii King 337
Balanocarpus ovalifolius Ridl. 340
Balanocarpus ovalifolius sensu Foxw. 339
Brachyptera Heim (section) 377
Bracteata Sym. ("group") 338, 341, 342, 344

Dilleniacea ? *nervosa* Wall. 371
Dipterocarpus Gærtn.f. 369
Dryobalanoides Miq. (section) 338
Dryobalanops aromatica Gærtn.f. 369
Dryobalanops fusca V.Sl. 379
Dryobalanops Keithii Sym. 379, **Plate 27**

Eushorea Brandis (section) 364, 366, 367

Hancea Griffithii (Kurz) Pierre 343
Hancea micrantha (Hook.f). Pierre 355
Hancea microptera (Dyer) Pierre 353
Hopea Roxb. 337
Hopea Beccariana Burck 340
Hopea Beccariana sensu Sym. 360
Hopea bracteata Burck 338
Hopea cernua Teysm. et Binn. 361
Hopea Curtisii King 337
Hopea dryobalanoides Miq. 345, **Plate 15**
Hopea Dyeri Heim. 353, **Plate 18**
Hopea ferruginea Parijs. 349, **Plate 17**
Hopea Griffithii Kurz. 343, **Plate 14**
Hopea Griffithii var. *pedicellata* Brandis 343
Hopea intermedia King 353
Hopea intermedia sensu Foxw. 350, 353, 360
Hopea latifolia Sym. 360
Hopea mengarawan Miq. 361
Hopea mengarawan var. *cernua* Burck 361
Hopea micrantha Hook.f. 355, **Plate 19**
Hopea micrantha (Hassk.) Benth. et Hook.f. ex Heim 355
Hopea micrantha sensu Brandis 350
Hopea micrantha sensu Burck 353
Hopea micrantha sensu Burkill 355
Hopea micrantha sensu Dyer 349
Hopea micrantha sensu Foxw. 345, 350, 355, 358
Hopea micrantha sensu Hance 355
Hopea micrantha sensu King 345, 349, 353
Hopea micrantha sensu Ridl. 350, 355
Hopea microptera Dyer ex Brandis 353
Hopea minima Sym. 337
Hopea minima var. penangiana Sym. 338, **Plate 10**
Hopea minima var. perakensis Sym. 338
Hopea minutiflora Fischer 381
Hopea myrtifolia Miq. 347, **Plate 16**
Hopea myrtifolia sensu Endert 350
Hopea myrtifolia sensu Heyne 350
Hopea nervosa King 341, 342
Hopea nervosa sensu Foxw. 341
Hopea nigra Burck 338
Hopea pedicellata (Brandis) Sym. 344, 349
Hopea Pierrei Hance 343, 353
Hopea Pierrei sensu Brandis 353
Hopea Pierrei sensu Foxw. 350 353
Hopea Pierrei sensu Ridl. 343, 353
Hopea sangal Korth. 338, 381
Hopea sarawakensis Heim 345
Hopea semicuneata Sym. 381

Hopea subalata Sym. 339, **Plate 12**
Hopea sublanceolata Sym. 341, **Plate 13**
Hopea sulcata Sym. 358, **Plate 20**

Parashorea aptera V.Sl. 373
Parashorea aptera sensu Foxw. 373
Parashorea Buchananii (Fischer) Sym. 375
Parashorea densiflora V.Sl. et Sym. 373, **Plate 24**
Parashorea globosa Sym. 375
Pinanga Brandis (section) 379
Pterigium Correa 369
Pterigium costatum Correa de Serra 369

Shorea Gærtn.f. 363
Shorea alba Ridl. 369
Shorea astylosa Foxw. 363
Shorea atrinervosa Sym. 363, **Plate 21**
Shorea Buchananii Fischer 375
Shorea ciliata King 363
Shorea collina Ridl. 364
Shorea collina sensu Foxw. 363
Shorea costata (Correa de Serra) J.S. Preslem 368
Shorea costata King 368
Shorea eximia (Miq.) Scheff. 370.
Shorea Faguetiana Heim 381
Shorea Flemmichii Sym. 378, **Plate 26**
Shorea Foxworthyi Sym. 366
Shorea furfuracea Miq. 371
Shorea furfuracea sensu Brandis 371
Shorea fusca Burck 370
Shorea gibbosa Brandis 381
Shorea Gysbertsiana Burck 378
Shorea inæquilateralis Sym. 377
Shorea inappendiculata Burck 365
Shorea "? inappendiculata" Sym. 363, 364
Shorea Kunstleri King 377
Shorea leptoclados Sym. 376, **Plate 25**
Shorea lumutensis Sym. 364, **Plate 22**
Shorea malaanonan Bl. 381
Shorea malibato Foxw. 363
Shorea Maxwelliana King 340
Shorea Meadiana Sym. 366, **Plate 23**
Shorea ovalis (Korth.) Bl. 370
Shorea palembanica Miq. 377
Shorea pauciflora King 377
Shorea platyclados V.Sl. ex Foxw. 377
Shorea polysperma (Blco.) Merr. 376
Shorea polysperma sensu Keith 376
Shorea rigida Brandis 371
Shorea rugosa Heim 372
Shorea rugosa sensu Sym. 372
Shorea rugosa var. uliginosa (Foxw.) Sym. 372
Shorea sericea Dyer 370
Shorea stenoptera Burck 378
Shorea sublacunosa (Miq.) Scheff. 370.
Shorea sublacunosa var. *angustifolia* Scheff. 371
Shorea submontana Sym. 368
Shorea sumatrana (V.Sl. ex Foxw.) Sym. 366
Shorea uliginosa Foxw. 372

Vatica dulitensis Sym. 381
Vatica eximia Miq. 370.
Vatica ovalis Korth. 370.
Vatica sublacunosa Miq. 370.

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